

# In the Supreme Court of the United States.

IN THE MATTER OF THE PETITION

OF

GEORGE WESTINGHOUSE, JR., and THE WEST-  
INGHOUSE AIR BRAKE COMPANY for a Writ of  
*Certiorari*.

## **Reply to the Brief for the Boyden Brake Company.**

His Honor the Chief-Justice was understood to say to counsel, at the time the motion was submitted, that, if the Boyden brief presented anything new, a reply thereto could be made.

The brief, as submitted, is believed to contain one or two matters of this kind.

1. It is contended in the Boyden brief that the suit is not one of peculiar gravity and general importance, for the reason that the *invention* of Patent No. 360,070 is not of *such* importance as the petitioners allege.

In support of this the Boyden brief asserts, in substance, that the invention of the patent in suit, No. 360,070, is not in use, either upon 400,000 freight cars or otherwise, "and has not been made since 1887." Brief, page 8, is thoroughly misleading, as are also the quotations from page 224 of the record.

What was asked of Mr. Westinghouse in those questions was whether the Westinghouse Company's catalogue for 1890 contained illustrations of their quick-action brake "like that shown in the

"drawings of the Letters Patent No. 360,070," or whether the company were *now* making or selling brakes of the type or form "shown in the drawings" of said patent.

This testimony is distorted from its actual meaning, which was, merely, that the Westinghouse Company were not now making *the particular form* of the invention shown in the drawings, into a statement that they were not utilizing *the invention itself*, which, being of a primary character, was capable of embodiment and expression in a number of forms.

The record abundantly shows that the Westinghouse Company are now manufacturing, and have been manufacturing since 1887, brakes which embody the invention of their Patent No. 360,070, and are based upon that invention, although, as in the case of all progressive manufactures, the form in which the invention is embodied has undergone development and change, and has been modified by the introduction of supplementary improvements, of which that of Patent No. 376,837 is of great importance.

This state of facts clearly appears by the decisions of the Courts to which reference has been made, and an attempt to make it appear otherwise in the brief of the Boyden Brake Company is hardly fair.

The statements contained in our original petition are strictly correct.

2. Again, in order to explain away the conflict of opinion between the appellate Courts in the two circuits, as to the validity of the second claim of 360,070, the Boyden brief relies on the differences between the alleged infringing structures.

This has to do with the issue of infringement—not with the issue of the validity of the patent.

While there were important differences of structure between the infringements complained of in the two cases, yet the Circuit Court of Appeals for the Fourth Circuit went far beyond the point of merely deciding upon these differences. It is true that it adverted to the difference between the two structures in the two concluding clauses of its opinion as a reason why it did not regard the opinion

of the Circuit Court of Appeals for the Second Circuit as controlling upon it, but it went much further than this, and expressly held, in the passages cited in our petition and in the accompanying brief, that the second claim was invalid, or, as stated, "fatally defective," because functional in character, and because it omitted necessary elements to make its combination complete.

The claim, on its face, clearly, in terms, covered the defendant's structure in the case in the Fourth Circuit. The Court got rid of its effect by holding that it was "fatally defective."

This was the real gist of the decision, and the basis of the opinion of the Court.

The reference to the difference of the structure before it and that before the Court for the Second Circuit was merely cited as a reason for not following the decision of that Court upon a point which they had already decided upon other grounds, which other grounds involve, as we submit, a clear conflict of opinion between the two Circuit Courts of Appeal.

In a case of the importance of the present one, where the invention is in use, and largely in use, in every circuit of the United States (as is shown in our petition and principal brief), it is essential that decisions so palpably in opposition to each other upon a fundamental point should be subject to the review of this Court. Other suits are pending in still other circuits (as shown by our petition) against still other forms of apparatus, and the validity of the second claim of the Westinghouse Patent No. 360,070 is a fundamental question in those suits, preliminary to the consideration of any question of infringement whatever.

That question can only be settled for the whole country by this Court.

This probably brings us to the limit of the permission granted us to reply. But it is believed that the other points of the Boyden brief, or most of them, are sufficiently discussed in our original brief.

GEORGE H. CHRISTY,

For Petitioners.

105. 049 & 078.

MAR 26 1896

JAMES H. McKENNEY, CLERK

Supreme Court of the United States.

*Brief of Christy & Betts for Westing*

OCTOBER TERM, 1895. Nos. 847 and 878.

*House Co. (on mo.)*

*Filed Mar. 26, 1896.*

BOYDEN POWER BRAKE COMPANY, GEORGE A. BOYDEN, President, CHARLES B. MANN, Secretary, WILLIAM WHITRIDGE, Treasurer, and BOYDEN BRAKE COMPANY,

*Appellants,*

*vs.*

*Appeal.*

GEORGE WESTINGHOUSE, Jr., and THE WESTINGHOUSE AIR BRAKE COMPANY,

*Appellees.*

GEORGE WESTINGHOUSE, Jr., and THE WESTINGHOUSE AIR BRAKE COMPANY,

*Appellants,*

*vs.*

BOYDEN POWER BRAKE COMPANY, GEORGE A. BOYDEN, President, CHARLES B. MANN, Secretary, WILLIAM WHITRIDGE, Treasurer, and BOYDEN BRAKE COMPANY,

*Appellees.*

*Cross-Appeal.*

Answer of Westinghouse Air Brake Company and George Westinghouse, Jr., to the Petition of Boyden Power Brake Company et al.

GEORGE H. CHRISTY,  
FREDERIC H. BETTS,  
*Counsel for Westinghouse Air Brake Company et al.*





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# Supreme Court of the United States.

OCTOBER TERM, 1895.

BOYDEN POWER BRAKE COMPANY,  
GEORGE A. BOYDEN, President;  
CHARLES B. MANN, Secretary;  
WILLIAM WHITRIDGE, Treasurer,  
and BOYDEN BRAKE COMPANY,  
Appellants,

vs.

GEORGE WESTINGHOUSE, JR., and  
THE WESTINGHOUSE AIR BRAKE  
Co.,

Appellees.

No. 847.  
Appeal.

GEORGE WESTINGHOUSE, JR., and  
THE WESTINGHOUSE AIR BRAKE  
Co.,

Appellants,

vs.

BOYDEN POWER BRAKE COMPANY,  
GEORGE A. BOYDEN, President;  
CHARLES B. MANN, Secretary;  
WILLIAM WHITRIDGE, Treasurer,  
and BOYDEN BRAKE COMPANY,  
Appellees.

No. 878.  
Cross-Appeal.

## ANSWER

**of the Westinghouse Air Brake Company and George Westinghouse, Jr. (complainants at Circuit), to the petition of Boyden Power Brake Company et al. (defendants at Circuit).**

In answer to the petition filed by the Boyden Brake Company *in re* motion to advance the hearing of the above-entitled causes, the Westinghouse Air Brake Company and Geo. Westinghouse, Jr., through their counsel, submit the following as their reply :

They have no objection to an early argument of the cases. But they do not understand that under Rule 26 they have any right to an advance, and, hence, they have not formally united in the application. It is a case between private parties solely. It is not a *criminal* case, nor a *revenue* case, nor a case in which the United States is concerned. But if, in the opinion of the Court, the cases involve or affect some matter of such general public interest that they ought to take precedence of other cases which have been still longer pending between private parties, then these repliants have no objection to their being advanced so as to be heard at some convenient time during the next ensuing term of the Court.

It would be practically impossible to get the record printed and proper briefs prepared under the rules before the probable end of the present term. The record contains over 1,400 pages of matter in book form, and includes a large number of drawings which would have to be reproduced by photo-lithography.

The general facts recited in the petition are stated purely from the Boyden standpoint, and for the most part, where material, are erroneous or misleading. These errors and misleading statements made are too numerous to be reviewed in a short reply.

Fact and fallacy are so dexterously intertwined in the petition that to separate them would unduly lengthen this reply.

Briefly summarized, the reasons alleged in support of the petition are as follows :

*1st.* The questions involved are of "*great public importance.*"

*2d.* The case involves only *one* question, *that of infringement*, and hence can be readily disposed of by the Court with "*no unusual amount of labor.*"

*3d.* The Boyden Co., partly as the result of an injunction and partly as the result of competition, has been kept out of a highly lucrative business for six years.

*4th.* Under Act of Congress of March 3d, 1896, Chapter 196, the business for which the Boyden Co. was organized will all be done by or before January 1st, 1898, and hence it should be allowed an early chance at the business.

*5th.* The defendant company has a patent, and in consequence of this litigation has been deprived of nearly four years' enjoyment of the seventeen years' privilege thus accorded to it, and it would be grossly unjust if such deprivation be continued for one or two years longer.

It is believed that every fact or alleged fact contained in the twelve pages of the printed petition comes under one or another of these five heads.

We will consider them separately :

*1st.* That the questions involved are of "*great public importance.*"

Several questions are involved which *vary* in importance.

(1) The question of *infringement*—that is, does the Boyden

device infringe the Westinghouse Patent—is (outside of the parties) of considerable importance to railway and transportation companies, but only indirectly so to the public at large.

(2) The Court of Appeals in the Fourth Circuit held that claim 2 of the patent in suit was “fatally defective.”

The Court of Appeals in the First Circuit, in another case, held that this claim 2 was valid.

Both actions of the Court are still in force, each in its own jurisdiction.

The claim as to which these contradictory decisions were made is the claim which, as is believed, in some respects best expresses, sums up and covers one of the essential mechanical features and combinations of operative mechanism which constitutes the “pioneer” or basic invention here in question.

This is *the* question which is raised under our first assignment of error. It is a question which (outside of the parties) is of considerable importance to railway and transportation companies, but only indirectly so to the public at large.

(3) The question raised by our second assignment of error as to the validity of the claim last referred to, as matter of law, has the same extent and limitations of public interest.

(4) The next assignment of error involves a question which is of general importance to all inventors, patentees and to all owners of patent property, and hence is of general *public* importance, in so far as *they* constitute or represent *the public*.

After the suit was brought the Boyden Company procured, in Boyden's name, a patent in which it was stated, in effect, that the Boyden invention was *substantially different* from that of Westinghouse. The proceedings under the Boyden application were wholly *ex parte*, Westinghouse being in no way heard or represented, or even notified.

The Court of Appeals in the Fourth Circuit, in the opinion which was filed, inadvertently fell into numerous errors as to matters of fact connected with Patent Office practice, but also made still more serious errors of law in holding that this action

of the Patent Office was "in effect a ruling that the Boyden "device did not infringe Westinghouse quick-action patent "number 360,070," that being the patent in suit, and, still further, was equally erroneous in its law when it said that "that "ruling takes rank here as the testimony of experts of the "highest experience, skill and knowledge in mechanics."

This is, we believe, the only question pending in this case which is of any *greater* importance to the *public* outside of railway and transportation companies than the questions which ordinarily arise in patent cases.

(5) The fourth and fifth assignments of error—the fourth as to the meaning of "substantially as described," and the fifth as to the effect of a mere erasure from a specification—are also of importance to inventors and patentees, but not more so to the public at large than is usual in patent causes, when similar questions arise.

Of course, all these questions are of exceedingly *great importance* to the parties themselves.

2d. The next point of the petition, as we have summarized it, is that this case involves only *one* question, that of *infringement*, and, hence, can be readily disposed of by the Court with "*no unusual amount of labor.*"

Thus, at the top of page 12, of the petition, it is said :

"No question of prior invention, anticipation or public use "is raised, but simply the question of infringement."

Our reply is :

(1) It does not require a record of 1,400 book pages to present simply *one* question of infringement.

(2) The conflicting opinions of two Circuit Courts of Appeals are to be dealt with.

(3) The validity of the second claim of the patent in suit, held valid in the Second Circuit, and invalid in the Fourth, is to be dealt with.

(4) The effort to make it appear that in the Circuit Court of Appeals for the Fourth Circuit, the invalidity of the second claim of the patent in suit was only *conditional* invalidity—that is, that the Court did not mean what it said—is not borne out by the record.

In the first place, the Boyden Company, in their answer, Record, page 9, paragraph 7, distinctly and unqualifiedly averred (referring to the patent sued on), that “the second claim is invalid, and should not have been granted.” Hence, by their own act, they made *this* one of the issues in the case.

In the next place, in the brief of the Boyden counsel in the Court of Appeals, a special section was headed with the following title :

“THE SECOND CLAIM IS VOID AS BEING FOR A FUNCTION AND NOT FOR A MECHANISM.”

Four pages of the brief (pp. 42-45), were exclusively devoted to maintaining the proposition stated in this heading, and no less than fifteen citations were made.

In the oral argument in the Court of Appeals (stenographically reported) one of the counsel for the Boyden Company introduced this part of his argument with the following words :

“Now, in the brief, and my time is so limited that I shall not take up the time to argue it orally, I ask your Honors to look at pages 42 to 45 of our main brief, which argues fully the question of the second claim being for a function and not a mechanism, and, therefore, void under the ruling in *O'Reilly vs. Morse*.”

*This* also is a question in the case, outside of infringement. For it is conceded on all hands that if the claim be construed as it reads, infringement cannot be denied. And this is the reason why the Boyden Co. elected to make an issue of the validity of this claim.



(5) And still further, the attack on the validity of this claim is the cause of the larger part of the 1,400 book pages of record. The Boyden Co. set up in defense and offered in evidence a large number of prior patents, English and American, and expeted them through hundreds of pages, and made and presented in evidence experimental constructions of some of them, in order, if possible, to detract from the merits of the invention in controversy, and to show that Westinghouse, under the patent in question, was not entitled to the benefits of the doctrine of pioneership which had been so overwhelmingly granted to him by the Court of Appeals in the Second Circuit.

Hence, the position of Westinghouse as a pioneer in the art is one which, under the proofs, will necessarily involve here, as in every case thus far argued, an amount of labor on the part of the Court much in excess of that which is usual in patent cases.

(6) The petition fairly bristles with statements which involve issues here in controversy.

Thus, the statement of the nature of the Westinghouse invention here in question, as found in the middle of page 3, is wholly misleading. In fact, the scope of the invention is one of the chief issues of the case.

So, in the first paragraph of page 4, the question as to whether Mr. Boyden "invented another and radically different" means for accomplishing the same result is one of the contested issues in the cause. What is there said on this subject is merely a statement of the Boyden position, while, according to the Westinghouse contention, the reverse is the case.

Several other misleading statements of like kind could easily be pointed out, if time and space permitted.

(7) The argument before Judge MORRIS at Circuit occupied four days. In the Court of Appeals two days were allowed, and the second day was extended beyond the usual hour for

adjournment. Both Courts found that "an unusual amount of labor" was involved.

Printed briefs and arguments submitted to the Court of Appeals when added up amount to *four hundred and thirty-six pages*. And all for what, in the Boyden Petitions, is alleged to be "simply the question of infringement!"

(8) The Boyden appeal includes *eighteen* assignments of error (Rec., pp. 1379-1381), which was certainly rather a large number on which to take up to the Court of Appeals "simply the question of infringement."

And the Westinghouse case went up to the Court of Appeals on *seven* assignments of error, and comes into this Court with *twelve more*.

Hence, it is believed that the petition somewhat understates the facts when it says that "simply the question of infringement" is involved, and that the cases will involve "no unusual amount of labor."

*3d.* The next point of our summary of the Boyden petition is that the Boyden Company, partly as a result of an injunction, and partly as a result of competition, has been kept out of a highly lucrative business now for six years.

Our reply is :

(1) If it is lucrative, the Westinghouse Company has made it so, and that is why it has had to raise and invest \$5,000,000 of capital, so as to be able to supply the demand which it has created.

(2) The railway companies are not complaining of excessive charges for brake apparatus.

(3) In so far as by lawful and proper competition, the Boyden Company may have been kept out of business for the past six years, the petition states no groundwork for the special interference of this Court.

(4) It is not true as represented on page 5 of the Boyden petition, that the Boyden Company and its co-petitioners were

ever under injunction. While an injunction was allowed, none was ever issued. If the petitioners ever discontinued business, they did it either voluntarily, or else because they made a brake apparatus which nobody would buy.

(5) And as the petition has traveled largely outside the record, we may be permitted also to go outside so far as to say that with the growth of the art, the Boyden device involved in this case has so far ceased to be in demand that the manufacture thereof was discontinued long ago, and the Boyden Co. is now seeking to introduce and sell a device *differing in material respects* from the one here in controversy. Hence, the question of infringement *as thus raised* is no longer a question of importance even *to the Boyden Company*—though it is to us—involving, as it does, the scope and validity of our patent.

4th. The fourth clause of our summary of the petition is to the effect that under Act of Congress, Chapter 196, the air brake business must all be done by or before January 1st, 1898.

(1) The Act of Congress referred to on page 6 of the petition (Act of March 3, 1893, Section 1 of Chapter 196) does not require, as cited in the petition, that “all railroads engaged in interstate commerce must be fully equipped with power brakes on or before the 1st day of January, 1898, or suffer a heavy penalty.” The section referred to reads as follows, and we italicise seven words:

“That from and after the first day of January, 1898, it shall be unlawful for any common carrier engaged in interstate commerce by railroad to use on its line any locomotive engine in moving intersate traffic not equipped with a power-driving wheel-brake and appliances for operating the train-brake system, or to run any train in such traffic after said date that has not *a sufficient number* of cars in it so equipped with power or train brakes that the engineer on the locomotive

drawing such train *can control its speed* without requiring brakemen to use the common hand-brake for that purpose."

Hence, all the act requires is that within the next two years *enough* cars must be equipped with power brakes so the train can be *controlled by the engineer*, which is a very different thing from saying that *all* must be so equipped.

Hence, in the orderly course of events, these cases will be reached and disposed of long before *all* the freight cars of the country will have been equipped with power brakes.

(2) Whether the Westinghouse Company can furnish air-brake equipment within the next two years for all freight cars which now are not equipped is a matter wholly outside the record, but we are authorized to say that the Westinghouse Company can supply such equipment to all the railways of the United States as rapidly as, with their present shop facilities, the railway companies can put them on. Hence, the railway companies will not suffer if these cases stand till reached on regular call.

(3) The air brake business will not end January 1st, 1898, as the petition seems to apprehend. In round numbers, there are about forty to fifty thousand new cars built in this country every year, and the number is more likely to increase than diminish. After this case is reached and disposed of on the regular call of the docket, if the result be favorable to the Boyden Co., it will find plenty of business still to be done.

5th. The Boyden Company also says that it has a patent, and in consequence of this litigation, has been deprived of nearly four years' enjoyment of it, and that it would be unjust if such deprivation be continued for one or two years longer.

This is wholly fallacious.

The taking of a patent does not grant to the patentee any right to make, use and sell, *which did not belong to him before the patent was granted*. The patent merely grants to the pat-

entee the right *to forbid others* from making, using or selling the thing patented. *This right of prohibition* granted to Boyden by his patent, he and his company have fully enjoyed ever since the date of the patent, and they are enjoying it yet. Hence, in this regard, the Boyden Company is not suffering any hardship of which they have any right to complain in this Court.

Respectfully submitted,

GEORGE H. CHRISTY,

FREDERIC H. BETTS,

Counsel for the Westinghouse Air Brake Co., &c.

# Supreme Court of the United States.

OCTOBER TERM, 1896.

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No. 403.

BOYDEN POWER BRAKE CO. ET AL.,  
DEFENDANTS AND APPELLANTS,

VS.

GEORGE WESTINGHOUSE, JR., and THE WESTINGHOUSE  
AIR BRAKE COMPANY,  
COMPLAINANTS AND APPELLEES.

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No. 426.

GEORGE WESTINGHOUSE, JR., and THE WESTINGHOUSE  
AIR BRAKE COMPANY,  
COMPLAINANTS AND APPELLANTS,

VS.

BOYDEN POWER BRAKE CO. ET AL.,  
DEFENDANTS AND APPELLEES.

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## **BRIEF FOR WESTINGHOUSE.**

Suit was brought in the U. S. Circuit Court for the District of Maryland by Westinghouse and The Westinghouse Air Brake Company, by bill in equity in the usual form, for infringement of the Westinghouse Patent No. 360,070, claims 1, 2 and 4.

Decision by MORRIS, J., was in favor of complainants under claim 2, that the claim was valid and was infringed, but adverse under the other two claims, the Court finding non-infringement as to these claims (Opinion, Rec., p. 842).

Each party appealed from so much of the decree as was adverse.

The decision of the Court of Appeals for the Fourth Circuit was adverse to complainants on all points, holding that the first and fourth claims of the Patent in suit were not infringed, and that the *second* claim was "fatally defective" (Rec., pp. 869-883). This opinion, as to the second claim, was in conflict with the decision of the Court of Appeals in the Second Circuit, sustaining the validity of the same patent, and was also believed to contain substantial error, both of fact and of law, which resulted in the decision of non-infringement of the other claims. Hence, the proceedings which resulted in the issue by this Court of a writ of *certiorari* (Rec., p. 890), and by which the cause is now here for review.

### **Assignments of Error.**

The assignments of variance and error set forth in the petition for writ of *certiorari* are as follows, so far as is necessary to present the questions here urged :

FIRST. As to the validity of claim 2 of the patent in suit, No. 360,070, as matter of law, on the face of such claim, the decision of the Court of Appeals for the Fourth Circuit is, in terms, and apparently in scope and effect, irreconcilably at variance with the holding of the U. S. Circuit Court of Appeals for the Second Circuit.

And herein your petitioners submit the following extract from the opinion of the Court of Appeals for the Fourth Circuit, in the cases Nos. 131 and 134, now sought to be brought before your Honorable Court by writ of *certiorari* :

" We think that when claim 2 of 360,070, in its language describing the action of that device, failed to describe any means by which the extreme traverse of the piston produced it, declaring merely that the piston ' by a further traverse, admits air directly from the main



air pipe to the brake-cylinder,' it was fatally defective, claiming only a result which is public property, and not identifying the specific means (his own property) by which the result is achieved."

In the Court of Appeals in the Second Circuit, this claim 2 of Patent 360,070 was held to be valid.

SECOND. As a matter of error herein, your petitioners submit that the said decision of the said Circuit Court of Appeals for the Fourth Circuit, that said claim 2 of Patent No. 360,070 is "fatally defective" in matter of form, or in the substance thereof, is not well founded in fact or in law.

THIRD. As further matter of error herein, your petitioners respectfully submit that manifest error was made by the said Circuit Court of Appeals for the Fourth Circuit, in its rulings as to the effect of the proceedings in, and action of, the U. S. Patent Office, and herein:

(1) That error was made in holding as matter of law or fact, without proof, that the said Patent Office "employs the best experts in mechanics which it can secure in this and other countries."

(2) That error of fact was made in holding that the examinations made in the U. S. Patent Office, though "*ex parte* in form," are "nevertheless conducted under hot and skillful contestation in every case of importance."

(3) That, possibly by these errors of fact, error of law was made wherein it was held by the said Court that, in granting a later patent to Boyden, without notice of any kind, "that action by the Office was in effect a ruling that the Boyden device did not infringe Westinghouse Patent here in suit, No. 360,070."

(4) Further error was made in holding, as a matter of evidence, that "that ruling [of the Patent Office] takes rank here as the testimony of experts of the highest experience, skill and knowledge in mechanics."

FOURTH. And, as matter of error and variance herein, your petitioners respectfully represent that the force and meaning of the phrase





"substantially as set forth," as explained and applied by the said Circuit Court of Appeals for the Fourth Circuit, is directly at variance with the decisions of this Court, and is in error as matter of law.

FIFTH. As further matter of error herein, and as a matter irreconcilably at variance with the ruling of the Circuit Court of Appeals in the First Circuit, your petitioners further submit that manifest error was made by the said Circuit Court of Appeals for the Fourth Circuit in holding, as matter of law, that *the mere erasure*, from the original specification, of a description of a proposed modification operates as a *disclaimer* of such modification.

SIXTH (original Eighth). The Court erred in holding that defendants' apparatus was not an infringement of claims 1, 2 and 4 of complainant's patent, and each of them.

As a further assignment of error (included in the original assignment of error before the Court of Appeals, Record, p. 862) we say :

SEVENTH. The Circuit Court of Appeals erred in not holding each of the claims Nos. 1, 2 and 4 of Patent No. 360,070 valid and infringed by the defendants.

These original assignments of error involve, in one form or another, the following material issues :

1. As to the *character, originality and extent* of the invention as made.

2. *As to the scope and proper construction of the Patent 360,070 granted therefor.*

The *validity* of the patent is not contested in the proofs, and the answer denies it only *pro forma*.

3. As to infringement.

As sub-heads, under the three issues thus stated, and collateral thereto, are the following :

4. The effect on Patent 360,070 of certain proceedings in the Patent Office in connection with the application therefor.

5. The effect of a patent granted to defendants, which was applied for *after* the suit was brought—all proceedings therein being *ex parte*.

It is believed that under the foregoing may be included all the questions, the consideration of which is desired in the present proceedings.

### **History of the Westinghouse Air Brake.**

The Westinghouse air brake has been developed through three forms or types, and the invention here in question relates to the perfected results.

The earliest form or type of the Westinghouse brake is referred to herein as the "plain" or "straight-air" brake.

The second type is that known as the "automatic" brake.

The third or final type is that known as the "quick action" or "emergency" brake. This final type of brake is the one patented in the patent in suit.

That Westinghouse invented them all—the "plain" or "straight-air," the "automatic" and the "quick-action" as well—is not denied.

Practically, he *created* the art of controlling the movements of trains by fluid pressure, and has also *perfected* it.

His exclusive right to the "plain" brake was established in *Westinghouse vs. Gardner & Ranson Co.*, 9 Pat. Off. Gaz., 538.

His exclusive right to the "automatic" brake never became a matter of litigation.

His exclusive right to the "quick-action" brake has been repeatedly affirmed, and affirmed in every case where the question has arisen.

In the present case, the Court of Appeals for the Fourth Circuit do not *deny* the right; they were of opinion that one claim was

"fatally defective," and the others *too limited* to embrace the defendants'.

In both these points, we submit they were in error.

A brief statement of the salient features of these three brakes will aid materially in an understanding of the present issues.

#### THE "PLAIN" OR "STRAIGHT-AIR" BRAKE.

In this there was an air-compressing pump, operated by steam from the locomotive boiler, by means of which air was compressed into a comparatively large reservoir, to a pressure of about eighty pounds per square inch. This reservoir, being still used, is now known as the "*main*" reservoir. From it an air pipe, sometimes called a "train pipe" led up into the cab, through the "*Engineer's Valve*," and thence down and *back* under the tender and cars, being united *between* cars, by India-rubber hose and metal couplings. These couplings were, and still are "automatically detachable;" that is, while they kept their grip or hold on each other, under the strains incident to the ordinary running of the train, they would readily pull apart under unusual or abnormal strains—as when a car coupling broke, and the train pulled in two.

Each car had a "Brake Cylinder," which contained a piston, the stem of which made connection with the ordinary brake levers. The piston was moved, so as to apply the brakes, by means of air pressure admitted into the forward end of the brake-cylinder, through a branch from the "main air" or "train" pipe.

A valve known as the "Engineer's Valve" was inserted in the line of this air (or train) pipe in the cab, and within easy reach of the engineer. When the brakes were to be applied the engineer shifted this valve so as to let the compressed air flow from the main reservoir back through the train pipe into the brake cylinders of the several cars, so as thereby to push back the pistons, actuate the brake levers and apply the brakes.

To release the brakes, he reversed his engineer's valve, and let

the compressed air escape from the brake cylinders by flowing forward along the train pipe to the escape port of the engineer's valve, and thence out to the atmosphere.

To "slow down," or hold his train in check and under control on a long down grade, the engineer made what may be called a *partial* application of the brakes. He admitted, say twenty, thirty or forty pounds of pressure to the brake cylinders—just as much or as little as he found to be necessary—and then *closed* his valve, so as to *hold that pressure*, without increase or diminution, till the occasion for slow speed was passed, or the foot of the grade was reached. This is commonly called "*graduating*." It means operating the brakes with a "*graduated*" pressure, or a pressure *less than the maximum*.

Hence, with the "plain" brake, if the engineer wished to stop *quickly*, he turned on the *full pressure* of eighty pounds, and turned it on as rapidly as he could make it effective.

If he wished to stop *slowly*, he turned on the pressure slowly.

If he wished to "graduate," that is to "slow down" without stopping, he turned on only a part of the pressure, much or little, as he might think necessary.

All three, that is a "quick" stop, a "slow" stop, or "graduating"—slowing down with *no* stop—all involved the same operation. In each and every case air pressure *direct from the main reservoir on the locomotive* was admitted to force forward the piston of the brake cylinder under each car, and so apply the brakes. As between the "quick stop," "slow stop" or "graduating" action, there was only a question of degree.

These were the leading appliances which made up the "plain" brake, as involved in *Westinghouse vs. G. & R. Co.*, 9 O. G., 538.

The Court of Appeals correctly described this brake in their "statement" accompanying the opinion (Rec., p. 870).



## THE WESTINGHOUSE "AUTOMATIC" BRAKE.

The "plain" brake answered its purpose in passenger car use for some years, but certain exigencies were encountered, in railway train service, which it failed to meet.

1st. For the stopping of trains it was sometimes too slow. The time required for the flow of *enough* air, even under high pressure, from the main reservoir on the locomotive, back to each of the successive brake cylinders of the train, and especially to the *last* ones, was considerable; it averaged fully *one second per car*. A train moving at the not unusual speed of fifty miles an hour is going over seventy feet per second. Hence, with the "plain" brake on a ten-car train, an engineer could not, even in the most alarming emergency, get the brakeshoes into any effective contact with *all* the wheels until his train had run a little more than one-seventh of a mile, and it was *after that* that the braking or stopping had to be done. It was of the highest importance, in times of impending danger, to save the ten seconds thus wasted while running that one-seventh of a mile.

2d. It depended for operation on air pressure *from the locomotive*. Trains meet with accidents. A car coupling breaks and the train pulls in two. While the engineer may easily, with the "plain" brake, stop the *forward* portion, or the section which remains connected to the locomotive, how is the rear portion to be stopped so as to avoid a dangerous collision by running into the front portion? This was an exigency or emergency for which the "plain" brake made no provision.

These with other defects or imperfections led Mr. Westinghouse to the invention of the "automatic" brake. How did he do it?

Retaining nearly all the mechanism which belonged to the "plain" brake, he altered radically its method of operation, and he added to it two mechanisms which largely remedied the defects above noted.

FIRST. He put *under each car* an air reservoir of sufficient capac-

ity to hold at least enough compressed air for *one operation of the brakes of that car*. Hence, when he wished to apply the brakes, the air necessary for doing the work was already present on, and distributed along, the several cars, and the delay of transmitting it back from the main reservoir on the locomotive through the long train pipe was wholly avoided. This saved the ten seconds, more or less, of time above referred to.

And as this car reservoir was *auxiliary* to the *main* reservoir it came to be known as the "auxiliary reservoir," and is so designated in the testimony herein.

SECOND. The other mechanism which Mr. Westinghouse added to the "plain" brake, so as to produce the "automatic," consists of what was then termed, and is still known as, a "triple valve," so called because, inserted at the junction of three pipes, it automatically controls the orderly flow of compressed air in three directions, by opening and closing, at proper times, three ports or valve openings, and thereby automatically effects or secures the orderly actions of the brake.

These three ports or valves are :

1. A port or valve from the train pipe to the auxiliary reservoir. This allowed the auxiliary reservoir to fill so as to be *ready* to apply brakes.

2. A port or valve from the auxiliary reservoir to the brake cylinder. This allowed flow of air to apply brakes and was called the "main valve" of the triple.

3. A port or valve from the brake cylinder to the open air. This caused the brakes to become or remain *released*.

A *considerable variety* of forms of these triple valves have been invented by Westinghouse and others, but their essential features are as above described.

The better to illustrate a "triple valve," reference may be made to the first drawing facing Record page 468, "Complainants' Exhibit Illustration Automatic Brake System," and to the middle section, marked "Ordinary Triple Valve." The three pipes entering the casing of the triple valve will be easily identified—the first coming up from the train pipe below, the second, on the left, leading to "Auxiliary Reservoir," and the third going upward to "8-in. Brake Cylinder."

With this "Automatic" apparatus, before the train starts, air pressure from the main reservoir is permitted to flow back through the train pipe. This pressure, entering the "triple valves" on all the cars (each car having its own "triple valve"), automatically shifts their moving parts so as to open the ports and passages which lead from the train pipe to the auxiliary reservoirs on all the cars, and so *charges them with full working pressure.*

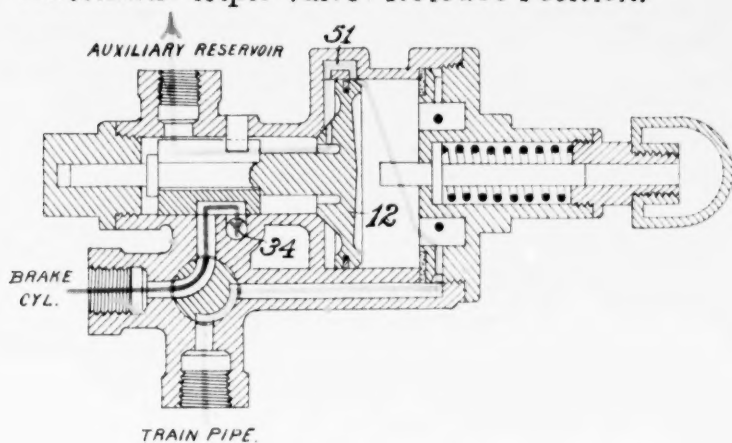
This operation may be illustrated by the use of the triple valve of Westinghouse Patent 168,359 (Rec., p. 752), merely changing, for greater clearness of illustration, the plane of the auxiliary reservoir connection from the side to the top of the case.

As will be seen, by examining the sketches, Nos. 90 and 91, opposite the following page, there are two positions of a "triple valve," by which three valvular openings or passages, for the admission or exclusion of the flow of air, are brought into action. The yellow line, sketch No. 90, shows the flow of air in the charging operation—*i. e.*, while the auxiliary reservoirs are filling up—and this position is the one which the parts maintain while the train is running, or in running order, and the brakes are "off."

This line of flow, or line of passages and ports through the triple valve, may, for convenience, be designated as *Passageway No. 1.* The port or valve which is opened is one which connects the *train pipe* with the *auxiliary reservoir.*

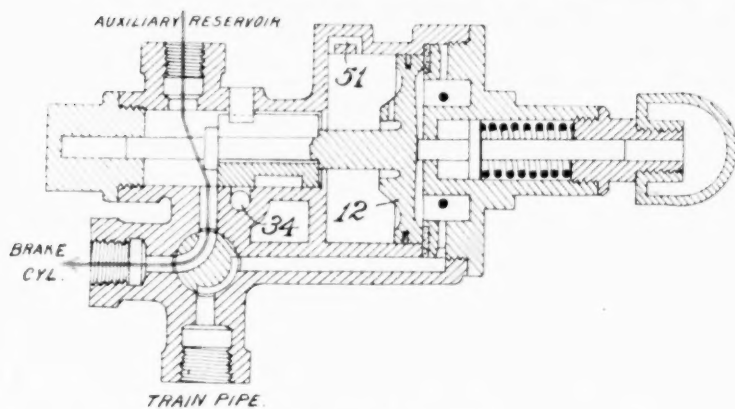
The second line of flow is from *brake cylinder* to the *external atmosphere.* This is also open when the auxiliary reservoir is being filled and when the train is in running order and the brakes are "off." It is indicated, in sketch No. 90, by the green line, and when

### Automatic Triple Valve: Release Position.



Sketch No. 90.

### Automatic Triple Valve: Service Position.



Sketch No. 91.

opened *releases* the brakes, and while open, keeps the brakes released, by keeping open a port or passage to the external air from the brake cylinder.

The third line of flow comes into use when the brakes are *to be applied*. The engineer then shifts his engineer's valve (not the "triple"), so as to let air *escape from the train pipe to the atmosphere*, at the engine. Then the higher, *unreduced* pressure in the auxiliary reservoir, acting backwardly, will operate the moving parts of the triple valve so as to close the port and passage leading back to the train pipe (Passageway No. 1), and close also the port or passage from the brake cylinder to the external air (Passageway No. 2), and *open* the port and passage which leads through the triple valve from the *auxiliary reservoir* to the *brake cylinder* (Passageway No. 3).

This (Passageway No. 3) is illustrated by the red line in Sketch No. 91, which represents the position of the triple-valve devices when the brakes are applied.

Passage No. 1 (Yellow line, Sketch No. 90) is closed by the back stroke of the triple-valve piston, in passing and cutting off the feed ports 51.

Passage No. 2 (Green line, Sketch No. 90) is also closed by the same movement—viz., by the valve H—cutting off the exhaust port 34.

But Passageway No. 3, indicated by a red line in Sketch No. 91, is now opened, so that compressed air may flow from each auxiliary reservoir to its own brake cylinder, and so apply the brakes.

The compressed air which thus flows from the auxiliary reservoirs to the brake cylinders constitutes the entire breaking force in the "automatic" brake which we are now describing.

As it has to flow but a short distance, it is subjected to little friction and gives greater speed of action than was obtained when the pressure had to be transmitted all the way back from the main reservoir on the engine, which was one serious defect of the "plain" brake.

In other words, it saved a large part of the ten seconds of time required in a ten-car train to do the preliminary work of bringing the brake-shoes into contact with the wheels, and thus saved nearly

the whole of the one-seventh of a mile of travel or distance previously lost, as above stated.

So much was saved as regards promptitude in getting the brakes at work.

How or why was it called "Automatic" ?

The brakes in this system are brought into action, primarily, by a *reduction*, at the locomotive, of train-pipe pressure. The engineer shifts his engineer's valve *at the engine*, so as to *vent* or *exhaust* pressure from the train pipe to the atmosphere *there*.

But it will be readily understood that if a train should pull in two, or a car become detached, the same escape of air occurs, and the same action takes place *automatically*, at the broken part, and the same result follows. Train-pipe air escapes through the separated couplings, back pressure from the auxiliary reservoirs shifts the moving parts of the triple valves, so as to apply the brakes, by *automatic action*, in the same way.

The "Automatic" brake is correctly described in the "statement" of the Court of Appeals (Rec., p. 871).

The "Automatic" brake, as thus organized, differed essentially from the "plain" or "straight" brake in its method of operation. Instead of being operated by charging pressure into the train-pipe, it was put into operation by *discharging pressure from* the train-pipe, and by such discharge of train-pipe pressure, or by merely *lessening* such pressure, the triple valves were shifted so as to charge pressure from the *auxiliary reservoirs* into the brake cylinders, and so apply the brakes.

This was wholly new with Mr. Westinghouse. It was a novelty in the mechanic arts, and, in fact, something of a paradox. But it was one of the fundamental principles of the "Automatic" brake, and gave to it, in large measure, its great success. For several years it was the standard brake of the world, and as an element or part of the "Quick-Action" apparatus, it is still a standard, conformed to and adopted by all builders of fluid-pressure train brakes.

## DEFECTS OF THE AUTOMATIC BRAKE.

Such, in a general way, and omitting some details not important in the present case, was and is the Westinghouse "automatic" brake, as it has been in use now for many years in the passenger car service of nearly all the railways in this country. The results of its use in passenger trains were so beneficial, and aided so greatly in the safe and expeditious handling of the train, that, as the passenger trains became equipped, railway managers bestirred themselves with reference to securing its benefits in freight-car service.

But, here, new and unexpected difficulties were encountered.

In the development of the business of transporting freight for long distances, and especially on roads having low grades, the tendency has long been in the direction of increasing the load. This has been done, partly, by building stronger and heavier cars, and, as a result of the building of larger and stronger locomotives, capable of hauling a greater number of cars, partly, by increasing the length of trains, so that they are composed of from thirty to fifty cars, or more. Hence, when the Master Car Builders Association of the United States undertook the solution of the problem of applying power brakes to freight trains, or rather, when they called, as they did, on the manufacturers of train-brake apparatus to solve that problem for them, they prescribed, as one of the essential features which such a brake must possess, that it must be capable of operating successfully, and *in all the exigencies of use, both ordinary and extraordinary, heavy and long trains, say of fifty cars.* This gives a train length of over one-third of a mile, or so nearly *one-half of a mile* that practically it may be called that (Westinghouse, Rec., p. 117, Q. 47).

On such a train, the exigency arose for still quicker action than any which had yet been contemplated. Necessarily, the longer and heavier the train, the quicker is it necessary to exert the full pressure of the brakes; and the longer the train the greater the rapidity required in successive action from car to car. Now, while it is true that, on a passenger train of six, eight or ten cars,



the difference in time between the application of the automatic brake upon the first and last cars is so small as to be practically inappreciable, yet, when we come to a train of thirty or *fifty* cars, it is found that in *emergencies, when "quick action" is required, this interval of time becomes so great that the comparative speedy action of the automatic brake was insufficient, and failed to solve that part of the problem.*

For the ordinary work of braking—that is, for lessening the speed of a train while running, and for holding a train in check on a down grade, as also for making ordinary "station stops," as they are called—substantially the same "automatic" apparatus, which had long been employed in passenger train service, was equally applicable, and with satisfactory results, in the equipment of freight trains, even to the extent of *fifty cars in a single train.*

But it was found that when, as in the presence of a great and immediately impending danger, it became necessary to stop a very long and heavy freight train *in the shortest possible time and distance,* and when, for that purpose, the maximum braking pressure was to be brought into practical operation with the utmost celerity, the action of the automatic brake was defective. In long trains, the presence of a considerable slack motion between cars (which is especially present in freight trains, owing to their looser form of coupling, aggregating from twenty-five to fifty feet in a fifty-car train), also tended to increase the shock of the rear against the front cars (Westinghouse, Rec., p. 118). Hence, the difficulty was a double one. Train-weight and train-length both conspired to prevent a successful solution. And it was to effect such solution that a new structure and method of applying full and quick pressure was invented by Mr. Westinghouse, so that the brake, while retaining its former satisfactory work and functions, might also perform, as required, the function of "Quick Action," and this constitutes the distinguishing feature of novelty of the invention here in question.

The DEFECTS of the automatic brake are correctly set forth by the Courts of Appeals in their "statement" (Rec., pp. 872-3).

## CAUSES OF THE DEFECTIVE OPERATION OF THE "AUTOMATIC" BRAKE ON LONG TRAINS.

We next inquire *why* the "automatic" brake was defective in quickness of action.

The quickness of action of a brake depends (*a*) upon the speed with which the compressed air flows or forces itself into the brake cylinder, and in so doing forces the piston home and puts the brake on, and (*b*) also upon the speed with which the braking action is transmitted from car to car.

The speed with which compressed air will force itself into the brake cylinder obviously depends, other things being equal, upon the size of the opening through which the air can rush in.

It was not found practical, however, to admit air *rapidly*, nor through a *large* aperture, *when* such air pressure was taken solely from the *auxiliary reservoir*. This fact is not denied.

There were, Mr. Westinghouse says,

"constructive reasons to limit the size of the passages in the triple valve making communication between the *auxiliary reservoir* and the brake cylinders, and for this reason a period of about three seconds was required to obtain the maximum brake force, from the time that the triple-valve mechanism commenced to admit it from the auxiliary reservoir to the brake cylinder" (Westinghouse, Rec., p. 121, fol. 182).\*

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\* The explanation of constructive reason for a *small* opening where auxiliary-reservoir pressure only was utilized is explained in the record at some length (Record, pp. 317-320), and the fact is undisputed. Another reason is, however, understood to be as follows:

It is well known in mechanics that a large valve, governing a large opening, is not so sensitive or delicate in its operation or movements as one which controls a small opening. Now, a small opening from the auxiliary reservoir to brake cylinder was needed for the comparatively sensitive operation, which was availed of day by day and hour by hour, and perhaps every few minutes, in the ordinary running of trains, in making frequent stops, or in going over different grades, or slowing up at crossings. A large opening from auxiliary reservoir to brake cylinder, by which very quick action alone could be attained, seemed inconsistent with the sensitiveness required for everyday use: and, as very quick action was only required in emergencies, and as emergencies were not happening every day, it did not seem possible to sacrifice the conditions necessary for the proper operation of the train day by day, for the sake of greater efficiency on rare occasions.

But, in addition to quickness of application of full brake force on individual cars, there was a requirement for quick *serial* application of the brakes on one car after another. The nearer the approach to simultaneousness in action throughout the train the better. Approach to simultaneous action, depends upon the speed with which an operative change of air pressure can be made to manifest itself on *successive* cars.

The "plain" or "straight" air brake had been slow, because the operative increase of pressure was large in amount, and had to be transmitted all the way from the locomotive to the rear car of the train, and operated on the cars successively one after another, the transmission of the pressure being, of course, delayed by the friction of the air in passing through the pipes.

The "automatic" brake, as we have already seen, improved upon this method of operation, by storing the pressure, which was to apply the brakes, in an auxiliary reservoir under each car, where it was near at hand and close to the brake cylinder to be operated by it. But it was still necessary, with the "automatic" brake, that an operative change of pressure, by reduction, should be transmitted all the way from the locomotive to the brake to be applied. True, in the case of the "automatic" brake, the change of pressure was by diminution, instead of increase, and the diminution in pressure, which was necessary to cause the triple valve to shift and open the passage from auxiliary reservoir to brake cylinder, was *much less* than the increase involved in the use of the "plain" or "straight" brake; but the *distance* at which the change in pressure was to be felt was still a factor which tended to produce a certain slowness of action, because the reduction took place first at the locomotive, and its effect had to be transmitted backward through the whole train.

What, therefore, was needed for the purpose of quickening the *successive* action of the brakes, when *very quick* action was imperative, was some device, subject to control by the engineer as to its use or non-use, by which, on the occasions when it was urgently needed, and *not* at any other time, (1st) a *larger* discharge of com-

pressed air into the brake cylinder could be had; and (2d), the necessary *escape* of air, adequate to shift each triple valve successively, should take place at or near such triple valve, without requiring the escaping air to travel all the way back to the locomotive (Westinghouse, Rec., 121-2).

#### THE "QUICK-ACTION" BRAKE.

Mr. Westinghouse took a fundamental step in remedying the defects of prior brakes, by the so-called "quick-action" brake, which is in controversy in the present litigation.

He perceived that what was necessary was to quicken the action of the brakes, *both* on each *individual* car, and *from car to car*; and the simple but beautiful expedient upon which he hit was that of modifying the old "automatic" brake so that, while it retained all its original functions for ordinary use, it should also have the capacity, under the control of the engineer, by which, when an emergency happened and great quickness of action was required, a passage should be opened directly from the *train pipe* (filled by the main reservoir on the engine) to the brake cylinder, and through which the *train-pipe* air *in bulk* could pour into that cylinder.

*This discharge of the TRAIN PIPE into the brake cylinder to produce QUICK ACTION was absolutely new with him.*

This operation resulted in charging or filling the brake cylinder, and applying the brakes, more quickly than before, and, also, by reason of the fact that the filling of the brake cylinder with air from the train pipe on one car, made what was in effect a *local* vent for release of pressure sufficient to operate the valve on the next car behind, each successive valve acted more quickly than when the diminution of pressure was caused by escape of air *only* at the engineer's valve on the locomotive.

The Circuit Court of Appeals, in the opinion under review, said (R., pp. 876-7) :

"It is not for us to describe how the introduction of train-pipe air into the brake cylinder of each car quickens the action of the brakes, which are already subject to the action of air from the auxiliary reservoir. It is sufficient to say that the engineer, by means of his

valve on the engine and by means of the branch pipe leading from the train pipe to the triple valve of each car, can, by the improvements in controversy, vent the air of the train pipe directly and more promptly into the brake cylinder, and thus more quickly apply the brakes, than he can by the indirect conduit opened by the main valve of 220,556 into the brake cylinder from the auxiliary reservoir when its position is in extreme traverse, as heretofore described. Quick action being the desideratum, the engineer effects it more promptly by the direct means than by the indirect."

Broadly speaking, therefore, Westinghouse's invention of the so-called "quick-action" valve for long trains, consisted of a provision for the admission or charge of air, at the will of the engineer, *direct from the train pipe* (instead of from the auxiliary reservoir alone) into the brake cylinder. This direct access of AIR FROM THE TRAIN PIPE *permitted the use of a comparatively large opening for that purpose*, without impairing the sensitiveness of the ordinary admissions of air from the auxiliary reservoir, and resulted in not only quickening the application of the brake on each car individually, but also resulted in quickening the rate of successive application from car to car, by providing at each car a local vent for the air, sufficient to move the triple valve of the car next behind it (Rec., p. 122, fol. 184 *et seq.*)\*

We next turn to see how this invention was embodied in practice in a given structure.

### **The Patent in Suit.**

The invention of George Westinghouse, Jr., above outlined, is described and claimed in his Patent No. 360,070, dated March 29th, 1887 (Record, pp. 782-789).

The specification contains the following brief and clear statement of the objects and *essential features* of the invention, in the following words (782) :

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\* It is true that the feature of local venting, in order to quicken serial action, had been *attempted* in an earlier patent of Mr. Westinghouse (No. 217,838), but *unsuccessfully* ; 1st, because the discharge of locally vented air was to the atmosphere and not into the brake cylinders, and hence the force was wasted, and, 2d, because the local venting took place *at every application*, and *not only* when the engineer so willed (see opinion MORRIS, J., p. 847).

"The object of my invention is to enable the application of brake-shoes to car wheels by fluid pressure to be effected with greater rapidity and effectiveness than heretofore, more particularly in trains of considerable length, as well as to economize compressed air in the operation of braking by utilizing in the brake cylinders the greater portion of the volume of air which in former practice was directly discharged into the atmosphere.

"To this end, my invention, generally stated, *consists* in a novel combination of a brake pipe, an auxiliary reservoir, a brake cylinder, and a 'triple-valve' device governing, *primarily*, communication between the auxiliary reservoir and the brake cylinder, and, *secondarily*, communication *directly from the brake pipe to the brake cylinder.*"

Then follows a description of the Westinghouse "Automatic" Brake and its mode of operation, and following this (p. 83) is a brief statement of the defectiveness of that brake in operation when the application of *full force* is required, viz.:

"Application of the brakes with their full force has heretofore required a discharge of air from the main pipe sufficient to reduce the pressure in said pipe below that remaining in the auxiliary reservoir after the brakes have been fully applied, and it has been found that, while the brakes are sufficiently quick in action on comparatively short trains, their action on long trains of from thirty to fifty cars, which are common in freight service under present practice, is in a measure slow, particularly by reason of the fact that all the air required to be discharged from the main pipe to set the brakes must travel from the rear of the train to a single discharge opening on the engine. This discharge of air at the engine has not only involved a serious loss of time in braking, but also a waste of air. Under my present invention a quicker and more efficient action of the brakes is obtained, and air which has been heretofore wasted in the application of the brakes is almost wholly utilized to act upon the brake pistons."

The inventor then proceeds with a detailed description of the drawings illustrating his invention, or the selected form thereof.

He chooses, for the purpose of illustration, a "triple valve" which (p. 784),

"accords substantially with that set forth in inventor's patent of the United States No. 220,556, granted and issued to me October 14, 1879,"

stating, however, that (p. 784) it is not claimed as of his present invention,

"saving however as to the structural features by which it performs the further function of effecting the direct admission of air

from the main air pipe to the brake cylinder, as presently to be described,"

Further on in the specification (785-6), and after describing all of those structural features which illustrate the triple valve of the patent in suit, as one of the "automatic" variety previously invented by him, he says :

"So far as hereinbefore described, the triple valve accords in all substantial particulars with, and is adapted to operate similarly to, those of my Letters Patent Nos. 168,359, 172,064 and 220,556, and, in order that it may perform the further function requisite in the practice of my present invention, it is provided with certain additional members, which will now be described."

What now are the *essential* "additional members"?

The patentee proceeds to explain the modifications of the described form of "triple valve," which are necessary to adapt it to "the purpose of effecting the admission of air directly from the "main air pipe 2 to the brake cylinder 7, when it is desired to apply "the brakes with great rapidity and full force."

These "structural features" or "additional members" consist, *essentially*, of, FIRST, a passageway through which air can be admitted *direct, from the main air (or train) pipe to the brake cylinder*, without passing through the auxiliary reservoir, and, SECOND, such a valve arrangement, in connection with such passage, that, when the triple-valve piston makes a short or preliminary movement, the passageway direct from the train pipe to brake cylinder, controlled by said valve, will *not* be opened, while, in the event of a long or full movement of the piston, or "further traverse," as it is called, such direct passageway *will be thrown wide open to the admission of train-pipe air*, and the brake cylinder will be rapidly filled thereby.

The drawings of the patent (Fig. 2) (Rec., p. 783) are rather small, and somewhat encumbered by the numerous figures of reference, so the enlarged drawings introduced into the record, preceding page 469 (original pages 741 and 742), and whose accuracy is undisputed, are here introduced. The principal parts are colored, so as to be easily distinguished.

These drawings showing the patented valve (in the form selected for illustration) in three positions, viz. : Drawing 13, in "Release" position, or "Brakes off;" Drawing 14, in "Service application"

*Auxiliary Reservoir.*

*Drake C.*

*Auxiliary Reservoir*

*Drake C.*



position, or brakes applied by auxiliary reservoir pressure, and Drawings 15 and 16, "*quick-action*" position.

The patent speaks of these last two operations as follows (p. 787) :

"The admission of air to the brake cylinder through the passage 31" (*i. e.*, from the auxiliary reservoir), "which is opened just before the piston stem comes in contact with the graduating stem, and which corresponds to the feed passage heretofore employed, suffices for the ordinary requirements of braking in regular service. In the event, however, of its becoming necessary to apply the brakes with great rapidity and with their greatest available force, the engineer, by means of the valve at his command" (*viz.*, the engineer's valve on the locomotive), "instantly discharges sufficient air from the front end of the main air pipe to effect a sudden reduction of pressure of about twenty pounds per square inch therein, whereupon the piston 12 of the triple valve is forced to the extreme limit of its stroke in the direction of the drain cup 19, carrying with it the stem 36 and auxiliary slide valve 41, which instantly uncovers the port 42 and discharges air from the main air pipe through the opening of the check valve 49 and the passages 46 and 48 to the brake cylinder, and, each car being provided with one of these devices, it will be seen that they are successively moved with great rapidity, there being practically, on a train of fifty cars, fifty openings for discharging compressed air from the main pipe, instead of the single opening heretofore commonly used. Not only is there a passage of considerable size opened from the brake pipe on each car, whereby the pressure is more quickly reduced, but the air so discharged is utilized in the performance of preliminary work, it being found in practice that the air so taken from the pipe will exert a pressure of about twenty-five pounds in the brake cylinders."

The operations described in the above paragraph will, we think, be made more clear by the drawings opposite the next page—Diagram 10.

In these simpler drawings, all details of construction, and all figures of reference, not necessary for a clear understanding of the structure, are omitted, and the essential parts are colored, so that their changes of position in the different stages of action can be easily followed.

The access of train-pipe air is shown located at the right end of the structure, instead of the left (as in the patent drawings), simply for greater clearness.

The "main valve" of the triple is *black*. Its office is to admit auxiliary reservoir air to brake cylinder.

The "quick-action" valve is colored *red*. Its office is to admit *train-pipe air* to brake cylinder.

The release port is colored *green*. Its office is to discharge air from brake cylinder, in releasing the brakes.

The flow or movement of air, in the several positions of the structure, is also shown by colored lines and arrows, viz.:

Air released from brake cylinder to open air by *green* arrow.

Air flowing from auxiliary reservoir to brake cylinder, in "service" application of the brakes, by *red* line. And air flowing from train pipe to brake cylinder in "quick-action" application by *blue* line.

As will be seen from the above description and drawings, in order to make possible either action or *non-action* of the emergency features, *at the will of the engineer*, Mr. Westinghouse *availed himself of the capacity of the triple-valve piston for varying lengths of travel*.

This double movement was not in itself new, but in his new combination he enabled it to perform a new function.\* He provided that the triple-valve piston, when operated by only a *slow or moderate* reduction of pressure, and when making only a *short* or "preliminary traverse," shall open and close the passageways, corresponding to Nos. 1, 2 and 3 in Sketches Nos. 90 and 91, by which the "auxiliary" reservoir was opened to, or cut off from, the brake cylinder; but, when moved by a *sudden or large* reduction of pressure, and given a *longer* or "further traverse," when and only when an alarming danger is near, it shall then *open a passage directly from the train pipe*, and thereby charge *train-pipe air directly into the brake cylinder*.

This gives what is known in this case as "Quick Action."

When only the regular service work of the brake is required, the engineer accomplishes this by a moderate or slow reduction of press-

\* The Court of Appeals attributed to Judge MORRIS, in the Circuit Court, the error of supposing that the double traverse of a triple-valve piston was in itself new.

In this they were themselves in error. What Judge MORRIS said was (Rec., p. 846): "It is shown that Westinghouse was the first to use a further traverse of the triple-valve piston to perform the operation required to vent the train pipe into the brake cylinder" (see, also, p. 847).

sure—say two, three or five pounds. This will cause the triple-valve piston to move through its “ preliminary ” traverse, and does all the work required in the normal running of even a fifty-car train.

But when serious danger impends, the engineer makes a sudden or considerable reduction of pressure—say fifteen or twenty pounds, more or less—and then the triple-valve piston makes a longer movement or “ further traverse,” and comes back with such force as to compress spring 39 and push valve 41 off its seat. The *direct access from train pipe* to brake cylinder is then open. Air rushes quickly and *in bulk*, as it were, from the train pipe to each brake cylinder, with the result : \*

FIRST. Of charging the brake cylinders with air pressure taken direct from the train pipe, increasing the efficiency of the brake by fully *twenty* per cent., by increasing its quickness in reaching full pressure (Rec., p. 124, fol. 186).

SECOND. That, by making a *new vent* at the triple valve of the *first* car, the reduction of train-pipe pressure at the triple valve of the *next* car is hastened, and the action of *its* triple valve is speeded. This second vent on the *second* car hastens, in like manner, the action of the triple valve on the *third* car, and so on from car to car throughout the train. In this way, the average time of transmitting the braking force and getting the brake shoes into actual engagement with the wheels on a fifty-car train was at first reduced from twelve to *six* seconds (Rec., p. 125), and was finally reduced to *two* seconds, or to the *one twenty-fifth* part of a second per car (Record, p. 134, fol. 201).

THIRD. This increased celerity in action and in power of application are placed *under the absolute control of the engineer*, by being so incorporated into the structure of the automatic brake that the latter retains *for service use* all the essential qualities and functions which especially fit it therefor, but has the superadded function of admitting train-pipe air *for emergency use*, by the opening of a direct

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\* See, for a further explanation of diagram 10, pages 54, 55 of this brief.

passage therefrom, *when* the piston makes its longer movement or "traverse."

These are the three things which, from a practical standpoint, make the Westinghouse "quick-action" brake, and these are the three points around which are centred substantially all the matters involved in the present controversy.

The specification, before making the claims, contains a generic clause, showing clearly that, within the contemplation of the inventor, the invention which he had made was not one which was confined to or limited by the special construction of the special triple valve which he had selected for the purposes of illustration. He says (p. 788) :

"In using the terms 'triple valve' and 'triple-valve device' I refer to a valve device, however specifically constructed, having a connection with the main air or brake pipe, another with an auxiliary reservoir or chamber for the storage of power and another with a brake cylinder or its equivalent for the utilization of the stored power and with a release or discharge passage for releasing the operative power from the brake cylinder, whether the valves governing these passages or connections are arranged in one or more series and are moved by a piston or its equivalent or by cases of pistons or their equivalents, there being numerous examples in the art of constructions, varying materially in appearance, whereby these functions are performed, both in plenum and vacuum brake mechanisms."

The inventor then states that his invention may be utilized in brakes which work by atmospheric pressure as well as those working by air under artificial compression, but he disclaims a construction of brake mechanism in which a passage from the main air pipe is *always* open, as this, he says, "involves an operation different from that of my invention." He then proceeds with his claims (p. 788), of which the 1st, 2d and 4th are as follows :

"1. In a brake mechanism the combination of a main air pipe, an auxiliary reservoir, a brake cylinder, a triple valve and an auxiliary valve device, actuated by the piston of the triple valve and independent of the main valve thereof, for admitting air in the application of the brake directly from the main air pipe to the brake cylinder, substantially as set forth.

"2. In a brake mechanism the combination of a main-air pipe, an auxiliary reservoir, a brake cylinder and a triple valve having a piston whose preliminary traverse admits air from the auxiliary

reservoir to the brake cylinder, and which, by a further traverse, admits air directly from the main air pipe to the brake cylinder, substantially as set forth.

"4. The combination, in a triple-valve device, of a case or chest, a piston fixed upon a stem and working in a chamber therein, a valve moving with the piston stem and governing ports and passages in the case leading to connections with an auxiliary reservoir and a brake cylinder and to the atmosphere respectively, and an auxiliary valve actuated by the piston stem and controlling communication between passages leading to connections with a main air pipe and with the brake cylinder respectively, substantially as set forth."

Nothing, as it seems to us, can be clearer than the scope of this invention and the meaning of the claims.

The inventor does not assert that he is, in the present specification, describing for the first time an air brake, nor an "Automatic" air brake; nor an air brake which may admit varying amounts of air from *auxiliary reservoir*, according to the varying movements of the triple-valve piston; nor a triple valve the length of whose piston movement could be varied.

All these things were old, and had been previously described or patented by himself.

What had *not* been done was to obtain "*quick action*" by the direct admission of *train-pipe air*.

He *now* asserts that he has produced, and described and illustrated in *one* form,

"A novel combination of a brake pipe, an auxiliary reservoir, a brake cylinder and a 'triple-valve' device governing, primarily, communication between the auxiliary reservoir and the brake cylinder, and, *secondarily*, communication directly from the brake pipe to the brake cylinder."

The preamble to the claims states in distinct terms that his invention is not embodied in a device in which train-pipe air is *always open* to the brake cylinder, and in which communication from the train pipe to the brake cylinder is simultaneously and *always opened* when the piston of the triple valve moves to open communication from the auxiliary reservoir.

The gist of the invention, and the vital point of its novelty, as contained in the preliminary statement of that in which it "consists," is that, in a combination of brake pipe, auxiliary reservoir, brake

cylinder and "a (*not* "the") triple-valve device," such triple-valve device shall "*govern*" primarily (that is, by its primary movement) communication from the auxiliary reservoir to the brake cylinder; and, secondarily (that is, by a secondary movement), communication direct from the brake pipe to the brake cylinder.

There is no mistaking the meaning of those words.

Taken in connection with the statement preceding the claims, in which the inventor expressly states that his invention is not limited in its application to the special form of "triple-valve" illustrated by him, but may be embodied in any "triple-valve devices," whether contained in one or several cases, or worked by one or several pistons, it is clear that the invention is not limited to any particular form or location of the new communication direct from train or brake-pipe to brake cylinder, nor to any particular form of valve for uncovering such direct passageway, when the direct admission of train-pipe air is to be effected.

True, in the illustrative form portrayed in the drawings, the direct passageway from train-pipe to brake cylinder is shown in the *outside* of the casing of the ordinary form of "triple-valve" illustrated, and the valve which closes and uncloses that passageway is outside of the ordinary triple-valve chamber, and is *pushed* off its seat, when required, by a supplemental stem, attached to the front of the triple-valve piston.

But, clearly, these details are not of the *essence* of the invention.

The essence "consists" in the fact that the triple-valve device, however it may be varied in form, and while retaining its well-known characteristics, shall "govern" (*i. e.*, control, at the will of the engineer, by some suitable form of connection), primarily, the port for discharge of air from the auxiliary reservoir to brake cylinder, and, secondarily, the port for discharge of air from the train-pipe to the brake-cylinder.

That the invention may be embodied in a variety of forms, without losing its essential character or necessary elements, will, we think, be evident from a few illustrations.

Two of these are shown in the opposite illustrative diagrams, Nos. 2 and 3, which are not in the record, but which serve to explain our position.

Diagram 2 shows a form in which the passage from the train-pipe to brake-cylinder is at the opposite end of the triple-valve device, but this clearly embodies the same invention.

So, again, the form of valve may be changed from a slide valve to a poppet and the invention will be clearly used, as shown in the next following figure (Diagram 3).

The picture of the valve of the New York Air Brake Co., shown in the opinion of the Circuit Court of Appeals (Rec., p. 883), is a still less closely related form, but was, apparently, conceded by the opinion below to embody the same invention, although the emergency valve was very differently located and was operated by air pressure only, made effective by the "further traverse" of the triple-valve piston.

Clearly, therefore, this invention is one which is not to be too closely tied to particular mechanical forms. It may be embodied, as expressly stated, in a great variety of forms. Its essential characteristics are, however, clearly stated, and the skill of the mechanic art is adequate to express the invention in a great variety of ways.

Doubtless, subordinate invention may be exercised in devising details of arrangement of passages, shape and location of valves, to promote compactness and convenience of the structure; but whenever the essential structural characteristics of the invention above described are found embodied in an "automatic" brake mechanism, whose triple valve "primarily controls the passage from auxiliary reservoir to brake cylinder, and, secondarily, controls the direct passage from train or brake-pipe to brake cylinder," there the invention of Westinghouse is found, and that invention cannot be obscured, nor the claims of the patent (if they be properly expressed) evaded by the ingenuity with which the respective "communications" or passages may be disguised, or the form and location of the valves which control them be modified.



This new invention of Westinghouse is expressed in and covered by the claims.

The second claim perhaps defines it more nearly in the language of the preamble of the patent than any other.

That second claim is in the following words :

"2. In a brake mechanism the combination of a main air-pipe, an auxiliary reservoir, a brake cylinder and a triple valve having a piston whose preliminary traverse admits air from the auxiliary reservoir to the brake cylinder, and which by a further traverse admits air directly from the main air pipe to the brake cylinder, substantially as set forth."

Obviously, that claim is not to be limited to the special passages or the special shape of valves chosen for illustration, nor to the pushing of the valve from its seat by an additional "piston-stem." If any brake mechanism, which is to be compared with that claim, contains the combination of a main air-pipe, an auxiliary reservoir, a brake cylinder and a "triple valve" having a piston; and if there be in the structure passages or "communications," *both* for admitting air from the auxiliary reservoir to the brake cylinder and *also* for admitting *train-pipe* air direct to the brake cylinder; and if the structure be such that the preliminary movement of the triple-valve piston (by acting through some suitable or well-known instrumentality) uncovers a communication or passage which only admits auxiliary reservoir air, while the secondary, or "further traverse" (in like manner) uncovers a passage which admits *train-pipe* air, then the essential "structural features" of that claim are present, and the invention of Westinghouse, as defined in the second claim, with all its great advantages, is found, irrespective of the special mechanical connections between the "triple valve" piston and the operating parts or valves, or of the character of those valves, or of the *particular* shape or *exact location* of the "communications" which are opened.

The first claim also states the invention of Westinghouse from another point of view, and defines a special embodiment of it. It is in the following words :



"In a brake mechanism, the combination of a main air-pipe, an auxiliary reservoir, a brake cylinder, a triple-valve, and an auxiliary-valve device, actuated by the piston of the triple-valve and independent of the main valve thereof, for admitting air in the application of the brake directly from the main air-pipe to the brake cylinder, substantially as set forth."

Here, the statement of the new invention is not defined by the requirement that the piston of the "triple valve" should have a "preliminary," and also a "further" traverse, or that the "preliminary traverse" shall govern one passageway, and the further traverse shall govern another.

The inventor is mindful of the fact stated in the preamble of his claims, that the "triple valve," properly so-called, may consist, not solely of a structure containing a *single* piston with *double traverse*, but may consist of a structure having a *series of pistons*, as well as a structure having a *single piston*.

He, therefore, here states his invention in terms which are applicable to either or both of such forms of structure, and defines his invention as one in which, in addition to a valve which admits air from the auxiliary reservoir to the brake cylinder (which is a function commonly performed in the older structures by what is known as the "main" valve of the triple), there shall be an "auxiliary valve" device, actuated by a triple-valve piston, *which shall admit air directly from the main air or brake pipe to the brake cylinder*.

In this claim, the feature of the invention, which is specifically pointed out and made the subject of the claim, is the fact that the direct admission of train-pipe air is effected by a valve "auxiliary" to that which is *primarily* relied upon to admit auxiliary reservoir air (called the "main valve").

In this claim the double traverse of a single piston is not required. It contemplates the possible utilization of *two* pistons, as stated in the preamble to the claims.

In the second claim, on the contrary, the inventor perhaps contemplated the possibility of the separate passages or communications from auxiliary reservoir to brake pipe being closed by a single physical valve-structure, although the opening of the two separate

communications was to be governed, one, by a "preliminary," and the other by a secondary or "further" traverse of the triple-valve piston.

Both claims together seem to adequately protect the invention of Westinghouse, so far at least as the present litigation is concerned.

Each points out *certain essential* features which were new with Westinghouse, and some or all of which were necessary for the production of his new result.

The fourth claim follows the line of the first claim with greater detail and particularity of description, and needs no further special attention, except to again recite its terms, which are as follows:

"4. The combination, in a triple-valve device, of a case or chest, a piston fixed upon a stem and working in a chamber therein, a valve moving with the piston stem and governing ports and passages in the case leading to connections with an auxiliary reservoir and a brake cylinder and to the atmosphere, respectively, and an auxiliary valve actuated by the piston stem and controlling communication between passages leading to connections with a main air pipe and with the brake cylinder, respectively, substantially as set forth."

**The invention of Westinghouse, of the quick-action brake, is a "pioneer" invention, or one fundamental in character.**

This point is so fully admitted in the opinion of the Circuit Court of Appeals, which is now before this Court for review, that lengthened discussion is unnecessary.

The Court of Appeals, while considering what is regarded as "fatally defective" *language* of the second claim of the patent in suit, yet conceded, in express terms, the commanding value and primary importance of the invention itself. It said (Record, p. 880):

"That this invention of Westinghouse, thus undefined, is one of the highest value to the public, and that it is a pioneer one in the art of quick-action brakes is not denied, and is conceded.

"It is conspicuously one of those pioneer inventions which entitle the proprietor to a liberal protection from the Court in construing the claim."

These words involve none too high praise of the invention of

Westinghouse, which is admitted to be first disclosed in the patent in suit.

An invention which resulted in placing it within the power of an engineer, running a train of 50 cars, to stop such a train in about half the time and half the distance (Rec., p. 127-8) within which any similar train had been previously stopped, is deserving of the public gratitude.

When it is considered that freight trains of such length have become the ordinary methods of transportation, and that, upon their safe running, hundreds, if not thousands, of millions of dollars' worth of property, and tens of thousands of valuable lives, are dependent, the inventor who has contributed in any marked degree to the protection of such lives and the preservation of such property, is entitled to all of the consideration, by way of a fair, and even liberal, construction of his claims, which Courts are able to accord to him, within the established rules of law.

As was said by the late Mr. Justice BLATCHFORD, sitting at Circuit in another case (*Poillon vs. Schmidt*, 6 Blatch., p. 303) :

"The invention as set forth in the Specification is a highly meritorious and useful one, and one which the Court will desire to sustain if consistent with the principles of law."

Judge MORRIS, in the present case, at Circuit (Record, p. 845), used the following language in regard to this invention :

"Now, although quick action emergency brakes were being sought for, no one before Westinghouse had accomplished this result, and the means by which he accomplished it were entirely novel. Indeed, upon first impression it is paradoxical and startling to find that, when a sudden, quick and powerful action of brakes is needed in the face of impending danger, it is to be obtained by a sudden large release of pressure in the train pipe, to the extent of 15 or 20 pounds below that in the auxiliary reservoir, and that by using this low pressure air to operate the brake cylinder, instead of the air under greater pressure stored up in the auxiliary reservoir, this remarkably effective application of the brakes is obtained. In the domain of quick action brakes this device would seem to belong to that class of pioneer inventions the patents for which are to be construed so as to be coextensive with the real invention, if the language of the claim will permit it."

The Circuit Court for the Southern District of New York (LACOMBE, J.), in *Westinghouse vs. New York Air Brake Co.*,

65 F. R., 99, in considering *both* inventions of Westinghouse relating to the quick action brake, viz., the one now before the Court, of Patent No. 360,070, and the later improvement of Patent No. 376,837, said, as follows, and in saying this, he was referring to the opinion of the Court of Appeals, Second Circuit, 63 F. R., 962:

"In those opinions it is held that the two patents 360,070 and 376,837 disclosed, the one the emergency valve, the other the supplemental piston or special motor, which, so far as the art has now progressed, appear to be both essential to the structure of a successful quick-action brake. Both of these inventions achieved great necessities and overcame great hindrances; each is an indispensable part of the 'bridge which carried railroad-car builders from failure to success;' both were products of the inventive genius of the same man; nothing anticipating either is shown."

\* \* \* \* \*

"Although 360,070 was not declared upon in the earlier suit, it was discussed at great length, and its meritoriousness was clearly recognized. The statements of the problem to be solved as it stood prior to January, 1888, and of the contribution of 360,070 to that solution, as they are set forth in the opinion above cited, leave no doubt that both the Circuit Court and the Circuit Court of Appeals regarded it as a patent of wide breadth; the only difficulty being to find sufficient standing room within the field it occupied to permit according to 376,837 also the necessary breadth of construction to cover the infringing devices then before the Court, and thus save to a meritorious inventor the fruits of his novel and most useful invention."

Under such circumstances, the utmost liberality may be used in dealing with the construction of the claims, and when, as in this case, the *fundamental means*, to wit, the utilization of train-pipe pressure for the purpose of effectuating the quick-action of the brakes, by admission directly to the brake cylinder, in advance of, or simultaneously with, the admission of auxiliary-reservoir pressure, are under consideration, the Court will not confine the invention with unnecessary rigidity to the particular mechanical instrumentalities by which the admission of this new source of air pressure is obtained.

"Means must necessarily be shown in the Specification, but the identical means, or the special devices, were not, in the language of

*Machine Co. vs. Lancaster*, 129 U. S., 263, 'necessary constituents' of the invention, either in the specification or in the Claim."

*Westinghouse Co. vs. New York Co.*, 63 F. R., 969.

"If the invention is broad and primary in its character, the range of equivalents will be correspondingly broad, under the liberal construction which Courts give to such inventions."

*Miller vs. Eagle Co.*, 151 U. S., 189.

Even a subsequent, and in some respects less important, invention of Westinghouse embodied in his second "Quick-Action" Brake Patent No. 376,837, was held by the Circuit Court of Appeals for the Second Circuit to entitle the inventor to a wide range of equivalents.

In *Westinghouse Co. vs. New York Co.*, 63 F. R., 969, the Court said :

"The skill and mechanical ingenuity of constructors of locomotives can, as will be seen hereafter, in the examination of other patents and of the infringing devices, arrange different details of mechanical construction by means of pistons, valves, ports and springs, which, adopting the supplemental chamber system first conceived and embodied by the patentee, and a kindred but not precisely the same mechanical method for the movement of the piston, will accomplish the same result. The patentee was a pioneer, in that he designed in No. 376,837 a new way to accomplish a desired result, but upon the same general idea which he had unsuccessfully tried to work out in the earlier patent. His later patent was the bridge, and not a mere step, which carried railroad-car builders from failure to success. It is not important now to determine the grade of its pioneering, and whether it may be classed in the list of those inventions which are of the highest rank; but it was an invention created to achieve great necessities and overcome great hindrances, and was one of wide breadth. A Court will not be justified in adopting 'a narrow or astute construction' which should minimize the character of the invention, leave its real scope open to trespassers, and thus 'be fatal to the grant.'"

This phraseology is even more fully and justly attributable to the invention of the present patent in suit.

### **The Burlington Trials.**

The history of the trials of air brakes which resulted in the patent in suit is fully described in the record (*Westinghouse Record*, pp. 117-131).

ented devices—utility. *But it contained a valuable invention and was afterwards improved in details, when patented in number 376,837, as to become a machine of great value to the public, a supplemental piston being supplied in 376,837.*"

This qualified denial of "utility" is, however, conceded later in the opinion in the following words (Record, p. 880, fol. 1419):

"That this invention of Westinghouse, thus undefined, is one of the *highest value* to the public, and that it is a pioneer one in the art of quick-action brakes, is not denied and is conceded. It is conspicuously one of those pioneer inventions which entitle the proprietor to a liberal construction from the courts in construing the claim."

In *Westinghouse vs. New York Co.* (59 F. R., 581, 612), Judge TOWNSEND, commenting upon the apparatus of this patent, said (p. 591):

"But it also appears that these defects were not occasioned by any inherent defect in the construction of the device shown in Patent No. 360,070, and that, when the necessary parts were afterwards adjusted, and, as testified by Mr. Westinghouse, 'when the passages through the quick-action portion of the triple valve were made sufficiently large,' practically the same results were obtained in train stopping as were subsequently obtained by the kind of valve shown in Patent No. 376,837."

In a subsequent case between the same parties, based upon a new infringement, Judge LACOMBE, in granting the preliminary injunction asked for by the Westinghouse Company, said (*Westinghouse vs. New York Co.*, 65 F. R., pp. 99, 104) (p. 100):

"It is unnecessary to enter into any elaborate statement of the history of the art, and of the impress left upon it by these inventions. That entire subject has been discussed with great care, and set forth at great length in the former opinion of this Court and of the Court of Appeals, delivered in the earlier actions between the same parties (59 Fed., 581; 63 Fed., 962). In those opinions it is held that the Patents 360,070 and 376,837 disclosed, the one the emergency valve, the other the supplemental piston or special motor, which, so far as the art has now progressed, appear to be both essential to the structure of a quick-action brake. Both of these inventions achieved great necessities, and overcame great hindrances; each is an indispensable part of the 'bridge which carried railroad car builders from failure to success'; both were products of the inventive genius of the same man; nothing anticipating either is shown."

This opinion was confirmed by the Circuit Court of Appeals (*New York Co. vs. Westinghouse*, 69 F. R., 715).

That a pioneer invention need not necessarily appear, upon its first trial, in its most perfect form has been distinctly ruled by this Court.

In the *Telephone cases* (126 U. S., p. 535) this Court said :

"The law does not require that a discoverer or inventor, in order to get a patent for a process, must have succeeded in bringing his art to the highest degree of perfection."

In *Mergenthaler Co. vs. Press Co.* (57 F. R., p. 506), the Court said :

"It would certainly be a novel doctrine to deny to an inventor the fruits of a broad invention because the machine which first embodied it was rudimentary in character, and failed to do as good work as improved machines made subsequently. None of the great inventions could survive such a test. Ten years after the invention of Howe, the machine first made by him would hardly have satisfied the least exacting sewing woman. The Dodds and Stevenson locomotive would, only a short time after its construction, have been discarded as behind the age, even by the savages of Tasmania. The telephone of Bell is not the perfected telephone of commerce; the Morse telegraph is to-day looked upon as an interesting antique. And yet, it would be an unheard of proposition to withhold from these illustrious men the credit they deserve because their machines were crude at first and were improved afterwards."

The defendants cannot, therefore, gain anything by commenting upon the defects which manifested themselves in the initial trial of the apparatus of the patent in suit; defects, as is seen, which were shortly remedied by the same inventor, and so promptly and perfectly remedied that at the time the testimony was taken, between 1500 and 1900 of these valves were in actual use (Rec., p. 149, x-Qs. 169, 170).

And the only change required for the purpose was purely a mechanical change—merely the enlargement of a port which was too small (Rec., p. 152, fol. 228).

The decision of Judge MORRIS herein was obviously correct, and, as we submit, should be affirmed. It runs thus (Rec., p. 851):

"It has been urged that the invention disclosed by the patent in suit is not of a meritorious character, because in the form in which it is there embodied, or at least in the first mechanism manufactured by Westinghouse, it failed of success in some essentials, and was immediately improved by Westinghouse in a manner which was the subject of a subsequent patent before it was successful in the use



for which it was intended. The defect developed by experimental test and which Westinghouse in a few months remedied was that the opening uncovered by the auxiliary valve was not sufficiently large to suddenly release the full volume of train-pipe air. This was not a defect inherent in the device (59 Fed. Rep., 581-591).

### **The Defendants' Valve, Its Structure and Mode of Operation.**

We have now considered the Westinghouse invention, its general character and essential features, and the position of Mr. Westinghouse as an inventor.

We are next prepared to consider the defendant's structure.

In this connection, it is fair to observe that the defendants' valve has been patented.

The patents of Boyden relating to his type of valve are found in the record, No. 481,134, dated August 16, 1892 (R., p. 797); No. 481,135, of August 16, 1892 (R., p. 809), and No. 481,136, dated August 16, 1892 (R., p. 817).

All of these patents were granted more than two years and a half after the commencement of this suit; and all of them, except the first, were applied for, more than a year after the commencement of this suit; and the first one, namely, No. 481,134, was applied for on September 30, 1889, and this bill was filed on December 12, 1889.

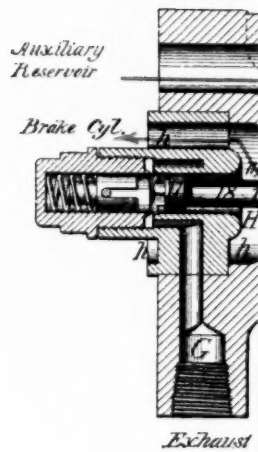
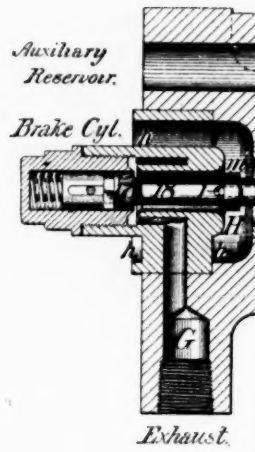
In each of the patents, Boyden endeavors to distinguish his valve, and its theory of operation, from that described and claimed in the Westinghouse Patent No. 360,070.

What effect of weight should be given to the statements in these patents, and to the fact of their granting—both occurring either in anticipation of, or during the pendency of the suit—is one of the points that we hereafter more fully discuss.

Judge MORRIS, in the Circuit Court, did not consider the grants of patents to Boyden, especially under such circumstances, as of any controlling importance (R., p. 852).

The Court of Appeals, on the contrary, considered the action of the Patent Office as





FOLDOUTS TOO LARGE TO  
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"In fact, a ruling that the Boyden device did not infringe Westinghouse's 'quick-action' Patent No. 360,070."

"That ruling takes rank here as the testimony of experts of the highest experience, skill and knowledge in mechanics" (Record, p. 879).

Here is a wide divergence of view.

There are two forms of the Boyden valve before the Court. One is the form described and illustrated in the Boyden Company's catalogue of 1889 (see Diagram opposite p. 44 of Record).

This form is substantially that illustrated in the Boyden Patent No. 481,134.

The second form of Boyden valve is that illustrated in the Boyden Company's catalogue of 1891 (see Diagram from said Catalogue opposite p. 36, which is here inserted).

This form is substantially that illustrated in the Boyden Patent No. 481,135.

The valve of Boyden Patent No. 481,136 needs no special consideration, as there is no proof, in the present case, that the Boyden Company ever manufactured or sold that form.

The defendants' valves of their 1889 catalogue and of their 1891 catalogue are so similar as not to need much separate discussion. The 1891 form is the latest form and the form most largely sold, and it will, therefore, be principally discussed.

Conclusions arrived at in regard to it will be applicable to the valve of 1889.

Considering, now, the defendants' valve of 1891, what features do we find that it embodies, and what is its mode of operation?

Its construction and mode of operation are fully described by complainant's witness, Mr. Newbury (Record, pp. 29-43).

Such mode of operation may be briefly summarized, as follows:

When the structure is to be prepared for action—that is, when the brakes are in a "release position"—the position is shown in the figured diagram (20) "Release Position" (Rec., p. 36).<sup>\*</sup> In this posi-

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\* The parts which, we contend, correspond to those of Westinghouse are here similarly colored.

tion, air under pressure, entering from the train-pipe, passes the edge of the triple-valve piston 29, through the small grooves at the lower and upper edges of said piston (or under check valve 26), and passes slowly into and through the passage A to the auxiliary reservoir until said reservoir is filled. The triple-valve mechanism is then in a position to act, when desired, for applying the brakes. The brake-cylinder is exhausted or opened to the atmosphere through the exhaust-passage G.

When the brakes are to be applied gradually or slowly, so as to make a "service" stop, air-pressure in the train-pipe is reduced slightly (say from three to five pounds), and the reduction of pressure on the right side of the piston 29 (such piston being subject to the full pressure of the auxiliary reservoir air on the left side, through a passage A) causes the triple-valve piston 29 to move to an intermediate position shown in diagram (21) "Service Application."

Such preliminary movement or traverse of the piston pulls the parts rigidly attached to said piston towards the right of the figure. One of those parts is the stem slide-valve 18, through which is the aperture, *i, k, j*,

In this position of the stem slide-valve, the opening, *i*, of this passage is upon one side of the part 22, through which the stem has been pulled, and the opposite opening of said passage, *j*, is on the opposite side of said part 22.

Auxiliary reservoir pressure, being operative through the passage A, on the left side of the piston, and through the aperture B, into the chamber C, holds the part 22 in a closed position against its seat, while such auxiliary reservoir air passes through the passage *i, j, k*, and from thence through the passage *h*, to the brake-cylinder.

By this action of the parts, a gradual or "service" application of the brakes, by auxiliary reservoir pressure only, takes place. The part 22 has not moved.

Now, if "quick-action" is required, a different set of operations is involved.

In that case, the travelling-piston 29, instead of only making a "preliminary" traverse to the intermediate position, as shown in

*Auxiliary  
Reservoir*

*Brake C*



*Auxiliary  
Reservoir*



(21), makes a full, or "further", traverse to the extreme right hand position, as shown in (22) (facing Rec., p. 37).

This is caused by the sudden lowering of the pressure in the train pipe on the right side of the piston to a considerable extent, say fifteen or twenty pounds.

The effect of this "further traverse" of the piston, acting quickly and with considerable force, as the result of the larger reduction of train-pipe pressure, is that the collar *m* upon the stem 18 pulls the part or valve 22 off its seat and *opens a comparatively large passage to the brake cylinder*, under the valve 22, and around the stem 18. The comparatively small amount of air pressure in the chamber C, being allowed to quickly diffuse itself through the large aperture to the brake cylinder, and being only slowly replenished from the auxiliary reservoir through the restricted aperture B, the result is that the pressure of train-pipe air, through the large passage F, in the centre of the triple-valve piston, throws open widely the large check valve 26, *and train-pipe air rushes directly to the brake cylinder*, through the large passage F, past the check valve 26 into the chamber C, under the valve 22, and thence to the brake-cylinder.

Auxiliary reservoir air also flows in, but much more slowly, owing to the fact that it must pass the restricted passage B, which is large enough to admit an adequate supply for service applications, when only the passage *i j k* is opened, but which is *inadequate* to maintain the pressure of air in the chamber C when the valve 22 is pulled clear away from its seat, by the further or extreme traverse of the piston.

These several operations will, perhaps, be more clearly perceived at a glance by inspection of diagram 14 on opposite page.

In this, all unessential details are omitted, and the valves for release, service and quick-action work are colored green, black and red, respectively, as in the Westinghouse diagram 10 (opposite p. 22).

So far, the experts on both sides agree as to the operation of the defendants' structure.

The defendants' experts, however, insist that there is an additional operation which *may sometimes* take place, which is this :

They say that, while the stem slide valve 18, with its aperture and ports *i, j, k*, is in fact used for graduating stops, or "service" stops, in many (if not in most) cases, yet that it is possible to move the triple-valve piston 29 to its extreme right-hand position *so slowly*, and therefore to open the valve 22 or pull it off its seat *so gradually* that the pressure in the chamber C will be reduced so slightly and slowly that the train-pipe air will not have sufficient preponderance to force or throw open the check valve 26, and hence that no train-pipe air will be admitted directly to the brake cylinder.

*In such a case*, they say, the brake cylinder will be filled by auxiliary reservoir air only, *even although* the piston 29 makes its further or extreme traverse, and even although the valve 22 is opened thereby.

Theoretically, this is possible, but the complainants prove—and the proof is uncontradicted—that this action can *never take place* until the brake cylinder, and the passages beyond the valve 22, *have been so nearly filled with air pressure* from the auxiliary reservoir *before* the valve 22 is pulled off its seat, that there is no substantial reduction of pressure in the chamber C as the result of opening said valve 22, and *no real use in then opening the valve 22 at all*.

On this point the evidence is decisive (see Newbury, R., p. 169, fol. 256 ; Barnes, R., p. 391 ; Westinghouse, R., p. 293, Qs. 431-435) ; and their statements are in accord with what an intelligent consideration of the operation of the structure shows *must be the case*.

Briefly, the fact is, as more fully demonstrated by Barnes experiments (Rec., p. 391), that in *service use*—that is, *without quick action*—the Boyden valve 22 cannot be opened at all to admit auxiliary reservoir pressure to the brake cylinder, until *after* ninety to ninety-five per cent. of such pressure shall have been charged through the port *i j k* ; and this being done, it *made no practical difference whether valve 22 was open or closed*, pressures being equalized at about ninety-eight per cent.

And this demonstrates that valve 22 does not and cannot perform any material portion of main-valve work—that is, the admission of *auxiliary reservoir* pressure to the brake cylinder. That work is done by the port *i j k*; and the valve 22 is (for all *practical* purposes) solely a “quick-action” valve.

Even Boyden cannot say that, as a fact, the valve 22 can *ever* be lifted from its seat without admitting train-pipe air direct to the brake cylinder, and thereby effecting a quick application of the brakes, except in the case of a *single valve* operating *by itself*, when tested in the defendants’ shops (Boyden, Record, p. 578, x-Q. 214).

And all he is willing to assert is that the valve 22 *may* be lifted for this slow admission of auxiliary reservoir air without causing “quick action” by the admission of train-pipe air, if the operation be performed *by “a careful engineer”* (Boyden, R., p. 579, x-Q. 216).

He goes further. He admits that he cannot say that, even with such an engineer, this manipulation could be effected, except on a comparatively *short* train, with a small and unknown number of cars (perhaps not beyond the tenth car, and certainly not beyond the thirtieth) (Record, Boyden, p. 579, x-Q. 215).

He admits further that the circular of the Boyden Co., issued in 1889, *makes no mention* of any such possible operation, although it *fully describes the others* (Rec., p. 575, x-Q. 199), and he also admits that the engineers’ valve, advertised by that company for use to apply brakes, has no running position which would result in such manipulation (p. 578, x-Qs. 210, 211). The assertion that the valve so operates is thus clearly shown to have been an afterthought.

Inasmuch as “quick action” of brakes, by the admission of train-pipe air direct to the brake cylinders, is particularly useful only on *long* trains of, say, from 30 to 50 cars, and as it is not even pretended that the Boyden valves can be so manipulated as to admit auxiliary reservoir air only, except on trains of 30 cars *or less*, and perhaps not on trains of more than *one* car, that particular juggling with the valve need not, we think, be taken into serious consideration.

The question is: What is the *ordinary operation* of the apparatus, when manipulated and acting in the ordinary manner, and on long trains of from 30 to 50 cars?

If, under such circumstances, the parts operate in a given way it is of little importance what they can be made to do by special manipulations on *short* trains, upon which their peculiar functions are not needed.

The operation of the Boyden valve, therefore, on long trains, and *under all ordinary circumstances of manipulation*, is as follows, and *only* as follows :

For "service" applications, or for graduating the speed of the train, the triple-valve piston 29 makes a preliminary traverse to the right, under the influence of a slight reduction of train-pipe pressure, and in so doing pulls out the stem slide valve 18 (black), so as to uncover its port *i*, opening the passage for auxiliary reservoir air only through port *i*, passage *k* and port *j* to the brake cylinder.

During this operation, the valve 22 (red) is not moved from its seat, and cannot move, because, until the brake cylinder is substantially full, and, therefore, until the brakes are, at least, *nearly fully* applied, the pressure upon its right-hand side, which holds it to its seat, will be greater than that upon its left-hand side, which would tend to force it from its seat.

Now, when "quick action" is required, the operation will be as follows :

A sudden great reduction of pressure in the train pipe on the right-hand side of the piston 29 will cause the said piston to make its complete or further traverse, and, as a result of that traverse, the valve 22 (*red*) will be pulled off its seat by the contact of the collar *m* with its under side. The air in the chamber C being then suddenly allowed to diffuse itself from the chamber C into the large brake cylinder, its *pressure* will be reduced, and the check valve 26 will open by pressure of train-pipe air, and train-pipe air will rush directly past the check valve, past the valve 22 and through the large openings thus formed into the brake cylinder.

The brake cylinder will be much more rapidly filled than when auxiliary-reservoir air *only* is supplied through its restricted passage, and the brakes will be applied with "quick action."



In the Boyden Patents will be found a description which accords with that given above.

Boyden Patent No. 481,135 says (R., p. 809) :

"This invention relates to the construction of valves for automatic air brakes, and has for its object to provide for admitting air-pressure to the brake cylinder from both the train-brake pipe and the auxiliary reservoir, thereby effecting a more powerful and also a quicker application of each brake and at the same time so quickly reducing the air pressure in the train-brake pipe adjacent to the said valves that all the brakes of a train will be applied at nearly the same time."

And, again, on page 812 :

"To apply the brakes by graduation a slight reduction of the pressure in the train pipe moves the piston 29 and its attached parts until the shoulder  $q$  on the stem 18 comes against the main valve 22 (the main valve remaining immovable on its seat, owing to the air pressure in the valve chamber C, holding it thereon). This movement closes the release valve port  $i$  and draws the graduating stem 18 through the main valve 22 sufficiently far to expose the graduating port  $k^1$  in the valve stem to the air pressure in the valve chamber C. The air then passes from the auxiliary reservoir by way of the large passage A and small passage B into the valve chamber C, and then through the graduating port  $k^1$ , passage  $o$ , and opening  $k$  in the valve stem and the passage  $g$  to the brake cylinder, where it affects the partial application of the brakes. This operation, which does not open the main valve port, is due to the fact that the restricted communication B, through which the auxiliary reservoir air enters the valve chamber C, is larger than the graduating port  $k^1$ , and, therefore, the pressure in the valve chamber is kept substantially equal to that in the auxiliary reservoir. This retention of the pressure in the valve chamber when graduating holds the main valve 22 and the check valve 26 seated on their respective ports."

And again (R., p. 813) :

"The brakes may be applied *fully* in two ways : first, by the auxiliary reservoir pressure alone, and, second, by the auxiliary reservoir pressure in conjunction with the train-pipe pressure. The first mode is used when an ordinary gradual stop is required, such as at a station. The second mode is used when an emergency stop is required, such as upon the occurrence of an accident. To apply the brakes fully for an ordinary stop, a limited amount of train-pipe air is continuously discharged from the engineer's valve, which reduces the pressure in the train pipe and slowly moves the piston 29 to the left and opens the main valve 22 sufficient to practically maintain the same air pressure on both sides of the said piston.

The piston and the said valve will be retained in the position just mentioned, or the position will slightly vibrate back and forward, causing the valve 22 to repeatedly unseat and seat by the discharge of the auxiliary reservoir air (through the valve chamber C to the brake cylinder), being about equal to the continuous discharge of air from the train pipe at the engineer's valve. Under these conditions the pressure in the brake cylinder, valve chamber C and auxiliary reservoir will equalize, and thus the ordinary function of the triple valve in applying the brakes fully by the auxiliary reservoir pressure alone is accomplished."

The latter part of this description, as we have already shown, is one of a merely theoretical operation.

The patent then describes its "quick-action" function, as follows (R., p. 814):

"To apply the brakes of a train quickly and with full power for an emergency stop, the engineer's valve will be moved to close communication between the storage tank on the locomotive and train-pipe and open the latter to the atmosphere and effect a sudden reduction of pressure of from ten to twenty pounds in the train-pipe. The effect of this sudden diminution of pressure in the train-pipe is immediately manifested at the triple-valve mechanism on the first car, causing the valve-piston 29 to be moved by the higher pressure of auxiliary reservoir air quickly to its full outward position, thus moving the main valve 22 and opening the main port *c*, so that the air pressure contained in the valve-chamber C may exhaust freely into the brake-cylinder. The supply of air from auxiliary reservoir to the valve-chamber is conducted through the restricted or small passage B. \* \* \* The exhaustion of pressure from the valve-chamber C or the great reduction of pressure therein following the sudden opening of the main port *c* brings said air pressure below that existing in train-pipe, whereupon the check-valve 26 will be immediately unseated by said train-pipe pressure, and train-pipe air will then pass directly into the brake-cylinder J, thus effecting the quick application of the brakes and also further reduction of pressure in the train-pipe that will be sufficient to accelerate the action of the valve mechanism on the cars following."

This patent of Boyden's No. 481,135 (as well as the other patents of Boyden's No. 481,134 and 481,136) seek, it is true, to disguise the really essential facts of the operation of the Boyden valve, and to differentiate its operation from that of the Westinghouse Patent No. 360,070, by including (as above quoted) a description of the intermediate kind of brake application, which the patent calls "full service application," and in which kind of application the

patent asserts that the structure will operate to apply the brakes fully by the *slow opening* of the valve 22, an opening *so* slow that that valve will admit only auxiliary reservoir air.

This alleged intermediate operation of the Boyden valve has, as we have seen, no real foundation in actual use. It is never realized in practice, as expressly proved by a practical engineer, Mr. Kidder, who used the Boyden valves in the practical running of trains (Record, pp. 425-428); also by Mr. Nellis, a practical machinist and locomotive engineer (Rec., 433-435), who took part in the same practical test; and there is not only no proof that it actually took place at all in practical use, but Boyden himself admits that he cannot say that it *could ever* take place in use *on long trains*.

This description of this alleged intermediate and theoretical mode of operation is apparently introduced into the Boyden Patents for the purpose of giving color to the propriety of calling the valve 22 "the main valve" of the triple valve.

Boyden had doubtless noticed that, in the Westinghouse Patent No. 360,070, Westinghouse speaks of the valve 41, which admits train pipe air directly to the brake cylinder, as a valve which is auxiliary to, and independent of, the main valve of the triple valve, and he apparently conceived the idea of *calling* the valve 22 (which certainly does perform the "quick-action" work in his valve), "the main valve," and by assigning to it a function in admitting auxiliary reservoir air to the brake cylinder, in a *possible* service application, he laid a foundation, as he supposed, for *asserting*, in his description, that he has dispensed with an *auxiliary*, or supplementary, valve for doing quick action work, and that he was performing that service by a valve which he *calls* the "*main valve*."

By so doing, he hoped to avoid the phraseology of the Westinghouse claims, and, so, the charge of infringement.

The difficulty with the contention is, that the *real* "main valve" of the Boyden structure, and of his patent, *is the sliding stem valve 18, with its port i, passage k and opening j, through which auxiliary*

reservoir air is admitted for all practical purposes, and under all practical circumstances—especially on long trains.

The “main valve” of a triple valve is the valve which is *relied upon* for the admission of *auxiliary reservoir air* to the brake cylinder in the operation of service braking.

It is that function which the stem slide valve 18 *always* performs in all *long* trains, and *for all practical purposes* even on short trains.

That valve 18, with passages *i, k, j*, is the true “main valve,” and that fact is not to be disguised, because Boyden has incorrectly *called* the valve 22 “the main valve,” when it is *really* the “emergency” valve, and never does operate otherwise on long trains at all; nor upon any trains, except as the result of some careful manipulation, after the brakes have been nearly fully applied, and when there is no use whatever of its operating.

**The Defendants' Valve Infringes the 1st, 2d and 4th Claims of the Westinghouse Patent No. 360,070.**

If the construction and mode of operation of the “quick-action” valve of the triple valve structure of the Westinghouse Patent No. 360,070, have been clearly explained and fully apprehended, and if the construction and mode of operation of the Boyden valve have also been clearly explained and apprehended, there will then be little difficulty in examining the question of infringement, especially in view of the fact that the invention of Westinghouse is concededly one of a “primary” character, and

*“is conspicuously one of those pioneer inventions which entitle the proprietor to a liberal construction from the Courts in considering the claim.”*

(Court of Appeals Decision, Record, p. 880.)

We first consider the second claim.

*(1) The Second Claim is infringed.*

The phraseology is as follows:

“2. In a brake mechanism the combination of a main air pipe, an auxiliary reservoir, a brake cylinder and a triple valve having a

piston whose preliminary traverse admits air from the auxiliary reservoir to the brake cylinder, and which by a further traverse admits air directly from the main air pipe to the brake cylinder, substantially as set forth."

Unless this claim be "fatally defective" (as held by the Court of Appeals, the error of which position we hereafter hope to show), it is clearly applicable to defendants' apparatus.

Defendants' apparatus is admittedly a brake mechanism possessing a double capacity; viz., (1) for service use, and (2) for emergency or "quick action" use.

It contains a combination of a main air (train) pipe, an auxiliary reservoir, a brake cylinder, a triple valve having a piston, and this piston *has*, and is designed to have, a *double traverse*.

Its shorter or "preliminary" traverse operates directly to shift the sliding stem valve 18, with its ports and passages *i j k* (black), so as to admit "auxiliary-reservoir" air *only* to the brake cylinder; and its longer or "further" traverse (when operating by a *sudden* and *comparatively large* reduction of pressure) unquestionably admits air from the main air (train) pipe to the brake cylinder. It does this by pulling the valve 22 (red) off its seat and opening a large passage to the brake cylinder, and by suddenly producing such large differential pressures on the opposite sides of the check valve 26, that it flies open and admits train-pipe air directly to the brake cylinder.

(2) *Even if the defendants' "quick-action" valve has an additional duty, that does not help defendants.*

Suppose it to be true, as alleged by the defendants, that, by *careful* and *slow* manipulation, the piston of the triple valve could be moved so slowly, and by such slight and gradual reductions of pressure, that the valve 22 *may* be pulled off its seat without allowing the introduction of any train-pipe air, or without allowing the opening of the check valve 26 for that purpose, does the capacity for this slow manipulation, by means of a very moderate and gradual reduction of air pressure, change the fact that, *with a quick and large reduction* of pressure, and a complete or "further traverse" of the piston *thereby* produced, the direct admission of train-pipe air

to the brake cylinder, and the resulting "quick action" of the valves, is inevitable?

Does the fact that the defendants have so constructed their valve that it not only performs *all* the operations of the Westinghouse valve, but is, *also*, capable, by very careful manipulation, of partially performing an additional function, make any difference?

We have already shown that this alleged additional function is of no real value. The apparatus cannot be manipulated so as to open the valve 22 to admit auxiliary-reservoir air, *without admitting direct train-pipe air*, except *after* the brake cylinders *have been substantially filled* with auxiliary-reservoir air, and hence the brakes have already been applied.

We have also shown that this possible manipulation cannot, in fact, take place in connection with the use of the apparatus on long trains, for which alone the apparatus is expressly designed; and that the alleged additional mode of operation is, therefore, an unimportant and idle one, under the very conditions in which the defendants' structure, as a whole, is designed to be operative and useful.

Admitting then, that, theoretically, the defendants' valve is capable of an *additional* mode of operation to those specifically described and claimed in the Westinghouse Patent in suit, does that relieve the defendants of the charge of infringement?

This has been so frequently denied by recognized text writers, and authoritatively decided to the contrary by courts, that a few references are all that is required to disprove the contention.

"One thing, to be equivalent to another, must perform the same functions as that other. If it performs the same function, *the fact that it also performs another function is immaterial to any question of infringement.*"

*Walker on Patents*, Sec. 352.

"Again, equivalence is not affected by the fact that the new element performs in the invention some function in addition to the old."

*Robinson on Patents*, Sec. 251.

"If the question was between a single patented device, conceded to be new, and a device claimed to infringe, because an equivalent, the alleged infringer could not protect himself by showing

that, although his device was an equivalent of the patented device in all its functions, and in its construction and mode of operation, yet, by other or additional features, it possessed other and further useful functions. Such a device would, perhaps, be an improvement upon the patented device, but must be, nevertheless, deemed an appropriation of the former."

*Sarven vs. Hall*, 9 Blatch., 524-538.

"The only difference worthy of notice is, that its forward edge or side is, in the Clipper, elongated and curved upward, in the more perfect form of a shoe. On that difference I have already observed at some length, and will not here repeat my observations. I may add, however, that it partakes rather of the character of difference in degree than difference in function, although, in the complainant's machine, this function of the device is imperfectly performed, and, in some situations, might not be effective. Besides, this Court, on a former occasion (*Sarven vs. Hall*, 9 Blatchf. C. C. R., 524), held that a device is not less an equivalent of another merely because, superadded to all the functions of such other, it may perform another office. Still less does it fail to be the equivalent of another, because, besides all the functions of such other, it performs some of the offices more effectively or better, so long as it performs them in substantially the same way, and uses substantially the same means."

*Wheeler vs. The Clipper Mower and Reaper Company*, 10 Blatch., 181-195.

"If not exactly the same thing, in mechanical construction, it is, clearly, a mechanical substitute for it. It may perform some other functions, but this does not prevent it from being an infringement."

*Norton et al. vs. California Automatic Can Co. et al.*, 45 Fed. Rep., 637, 638.

"The mechanism of Gordon is simply reversed in Palm's device. In the former the upper sharpened edges of the cleats on the wedge arms, and the lifting of the casing cause the wedge arms to catch the well wall, and thus secure the starting point in a self-supporting casing, viz., a stationary base; in the latter, the spring and gravity, or jarring, cause the same result, though from an opposite starting point. In both, increased pressure on the wedge cone aids and finishes the work. *That the additional function of the wedge arms helping sustain the casing appears in the Palm device does not make it any less an infringement.* It is still Gordon's device inverted, plus the added function of the sustaining aid of the wedge arms. As such, it is our duty to decree it an infringement." \* \* \*

*Musseth vs. Palm*, 51 Fed. Rep., 824, 826.

"If the mode of effecting the continued mixture adopted by defendant should be deemed a new and useful improvement, they might perhaps have a patent for that particular device without being entitled to use Tilghman's process, on which it is but an improvement.

\* \* \* \* \*

"The introduction of an improvement gives no title to use the primary invention upon which the improvement is based."

*Tilghman vs. Proctor*, 162 U. S., 707.

"If he be the original inventor of the device or machine called the 'divider,' he will have a right to treat as infringers all who make dividers operating on the same principle, and performing the same functions by analogous means or equivalent combinations, *even though the infringing machine may be an improvement of the original, and patentable as such.*"

*McCormick vs. Talcott*, 20 How., 402.

See, also,

*Blake vs. Robertson*, 94 U. S., 728-733.

*Cochrane vs. Deener*, 94 U. S., 780-786, 787.

*Marsh vs. Seymour*, 97 U. S., 349-359.

(3) *The fact that defendants selected a different form of triple valve, to which to add the "Quick-Action" element, does not help them.*

Nor, again, can the defendant escape the charge of infringement solely because his apparatus is very different in form or appearance from that of Westinghouse?

The contrary of this has been so definitely stated by this Court as to leave nothing further to be advanced on the subject.

In *Machine Co. vs. Murphy* (97 U. S., 120), this Court said:

"Similarities or differences are not to be judged by the names of things, but the machines, or their several devices or elements, must be examined in the light of what they do, or what office or function they perform and how they perform it. One thing is substantially the same as another if it performs substantially the same function or office in the same way to attain the same result; and things are substantially different when they perform different duties or in a different way or produce a different result. For the same reason similarities or differences are not determined by the mere fact that things are apparently the same or are of a different shape or form; but the true test of similarity or difference is the same in regard to shape or form as in regard to names. In both cases regard must be had to the mode of operation or the way in which the parts work, and the result as well as the means by which the result is attained."

Let us apply these principles to a comparison of the Westinghouse structure with that of the defendants.

The illustrated form of the Westinghouse structure is that of a



triple valve of the form shown in the Westinghouse prior Patent No. 220,556, but provided with certain additional structural features which give it the capacity for "quick action."

The defendants' structure is also a triple-valve apparatus, modified by the addition of certain structural features, which confer upon it the same additional function.

Of course, the particular form of the triple, which is used as the basis of "quick-action" modification, is unimportant.

Westinghouse has (as already seen) expressly guarded, in the preamble to his claims (Record, p. 788), against any limitation to his specific form of triple valve upon which his improvements are engrafted.

And, if the Westinghouse Patent had not contained this express statement, the law would imply the same or an equivalent recital.

A few illustrative diagrams will, perhaps, better than mere description by words, illustrate the fact that, for all essential purposes of the Westinghouse invention, the defendants' apparatus is a mere change of form.\*

Let us see how this is, by a renewed study of *the exact mode of operation* of the Westinghouse structure :

Opposite the next page is diagram 10 (already used at p. 22), illustrating the particular type of triple valve adapted for "quick action" which is illustrated in the patent in suit, No. 360,070.

Unnecessary parts are omitted, and only those features which are here in controversy are shown.

Colors are used, so as to place clearly before the eye the several parts, so that they may be carried in mind. The different air pressures, and the directions of air pressure, are shown by appropriately colored lines in the different figures. The figures show the several parts of the valve in its three characteristic positions.

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\* These illustrative diagrams are not a part of the record ; they are simply a means of conveying to the Court our idea of the character of the changes made by defendants, as being simpler and more easily understood than words alone.

The first figure shows the apparatus in the "Release" Position, or "Brakes Off."

The triple-valve piston occupies its extreme left-hand position. The "main valve" (colored black) closes the access from the auxiliary reservoir to brake cylinder, and leaves open (as shown in green) the valve aperture from the brake cylinder to the open air.

The opening from the train pipe is closed by the "quick-action" or *emergency* valve (colored red), and by the check valve located below.

The check valve is kept closed by a spring until the difference in air pressure upon its two sides is sufficient to open the valve against said spring.

As the emergency valve (red) prevents any excessive pressure on top of the check valve in the Release position, the check valve is kept closed.

An interior auxiliary poppet valve of Patent No. 220,556 (colored yellow), to be hereafter explained (pp. 69-78), is closed.

The second Figure, on the same page, illustrates the change of position of some of the parts when the piston takes a "preliminary," or half traverse to the right, under the influence of a small reduction of train-pipe pressure.

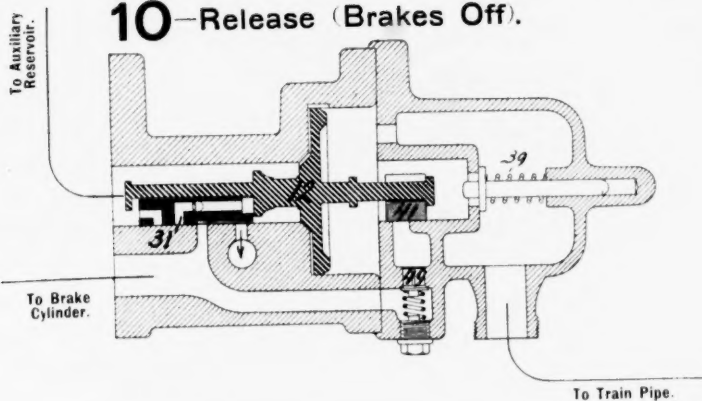
Under such circumstances the "main valve" (black) has been shifted so as to bring one of its apertures opposite the port to the brake cylinder.

The poppet valve (yellow) has been also shown pulled to the left. Auxiliary reservoir air (shown by a red line and red arrow) now enters the brake-cylinder, and the brakes are applied by auxiliary-reservoir air only ("Service" or "Graduating" work), through the comparatively small passageways in and controlled by the "main valve."

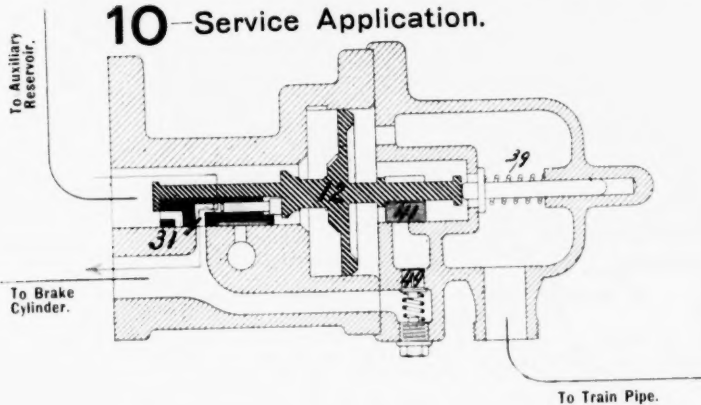
The shifting of the "main valve" has also closed the exit from the brake cylinder to the atmosphere (colored green), so that the air charged into the brake cylinder cannot escape.

The emergency valve (red) still remains closed. The piston has not traversed sufficiently far to move it. As there is no preponder-

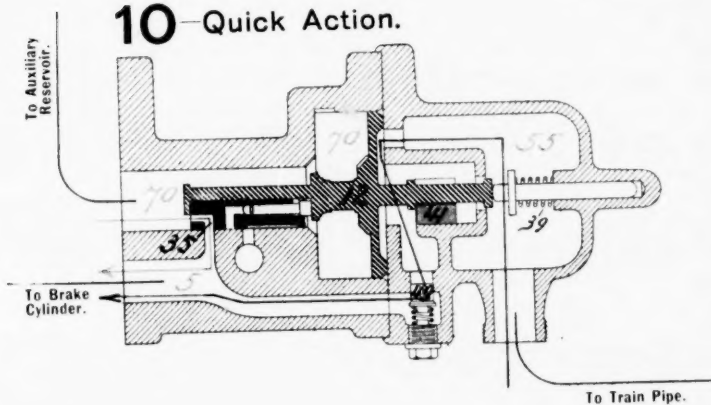
# 10—Release (Brakes Off).



# 10—Service Application.



# 10—Quick Action.





ating difference of pressure on opposite sides of the check-valve, the check-valve also remains closed, and there is no access of train-pipe air to the brake cylinder.

The third figure on the same page, shows the position of the parts when the extreme or "further traverse" of the triple-valve piston takes place, under the sudden and large reduction of train-pipe pressure. In this case, the release-port from the brake cylinder to the atmosphere (green) still remains closed, and the brake cylinders may be filled. The main valve (black) has been shifted further to the right and therefore still admits auxiliary reservoir air (shown by the red line and arrow); *but slowly*, because of the small size of the aperture.

The sudden lowering of the train-pipe pressure, and the quick and extreme or "further traverse" of the piston, have, however, pushed the emergency (red) valve off its seat. *The check valve has now been subjected to a marked difference of pressure on opposite sides.*

The train-pipe pressure, although reduced to 55 pounds from its initial force, is still vastly in excess of the pressure *slowly percolating from the auxiliary-reservoir through its restricted aperture*, and expanding in the large spaces below and beyond the check-valve. Consequently, the check-valve *now opens*, and train-pipe air (shown by the blue line and arrow) rushes directly through the comparatively large passages and apertures to brake cylinder, the brake cylinder is, therefore, *quickly filled* and the brakes are applied, with "quick action." \*

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\* In this, and in all other diagrams, the *red* numerals indicate the differing ("differential") air pressures which exist for a moment ("momentarily"), when the "quick-action" valve is opened, and which differing pressures, then existing on opposite sides of the *check valve*, cause it to open and admit TRAIN PIPE air.

Now, to see what changes may be made in the illustrated form of the Westinghouse apparatus of Patent No. 360,070, let us examine a structure in which one feature, wholly unnecessary for "quick action" (which is the main feature in controversy here) is eliminated.

This feature, which we are now to consider as eliminated, is the supplementary poppet valve (yellow).

That valve is, as will be fully explained, merely a delicate valve for *closing* and *reopening* the aperture through the main valve, *after* the latter has once been moved into a position which permits the brakes to be applied, *without requiring the main valve to again move*.

It performs no function in connection with "quick action," and may, therefore, be left out of account *for the present*.

On the opposite page is shown (diagram 1) a triple-valve contrivance, adapted for *quick action* in the manner described and claimed in Patent No. 360,070, but with this delicate "poppet" valve (yellow) omitted.

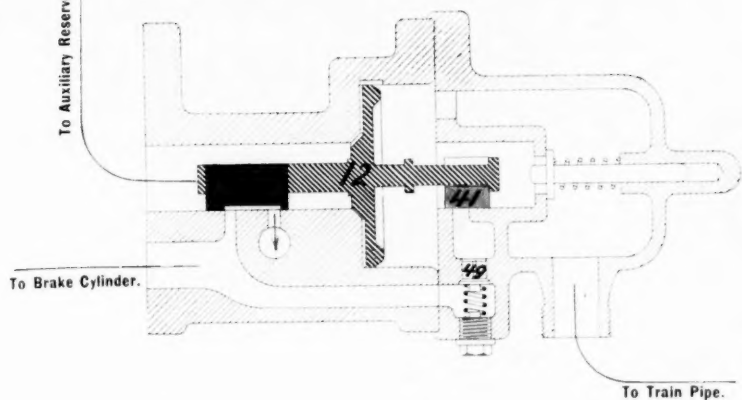
It will be immediately perceived that all the essential operative "quick-action" features are present in this modified valve, although the delicate poppet valve (yellow) is omitted.

The first figure represents the parts in the initial or "release" position, with the brakes off. The triple-valve piston is in its extreme left-hand position. The main valve permits the opening (green) from brake cylinder to atmosphere to exist. The access from the auxiliary reservoir to brake cylinder is closed by the "main valve" (black). All access from train pipe to brake cylinder is closed by the emergency valve (red).

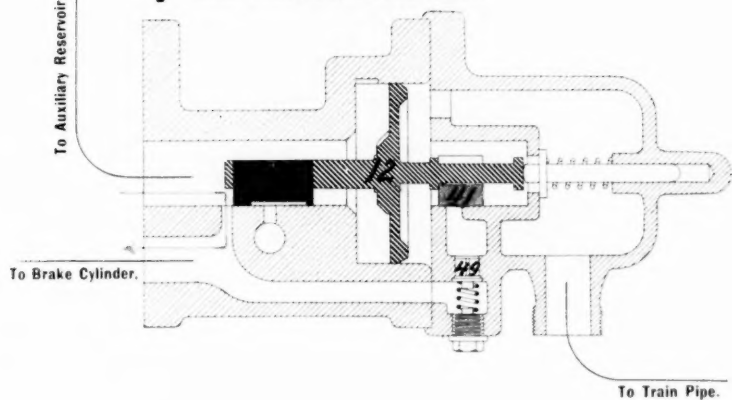
The second figure, on the same page, illustrates the position of the parts in "service" work.

The main valve (black) has been shifted to close the aperture (green) from brake cylinder to the air. The restricted aperture from auxiliary reservoir to brake cylinder is opened, and auxiliary reservoir air (red line and red arrow) is filling the brake cylinders. The access from train pipe to brake cylinder is closed by the emergency (red) valve and by the check valve.

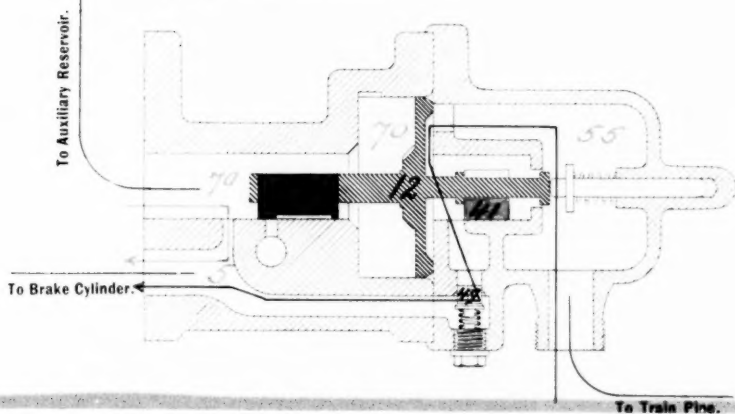
# 1—Release (Brakes Off).



# 1—Service Application.



# 1—Quick Action.







The third figure represents the same apparatus in "quick-action" position.

The piston has been shifted to the right, and makes its extreme or "further" traverse. The emergency valve (red) has been pushed off its seat. The *difference of pressure* on opposite sides of the check valve now causes the check valve to open. Train pipe air (indicated by blue line and blue arrow) flows direct to the brake cylinder, and is accompanied by a smaller amount of auxiliary reservoir air (indicated by red line and red arrow).

No one will dispute that the invention of Patent No. 360,070 is clearly illustrated in the apparatus thus shown.

Now, let us proceed a step further.

It is obviously not important that the emergency valve (red) should be located on the *right* side of the piston, or that it should be *pushed* off its seat.

If the mere location of the principal passages be changed, the emergency valve (red) may be located on the *left* side of the piston.

The diagram opposite, marked 2, illustrates these changes in the location of the parts, being otherwise the same as diagram 1.

A few moments' inspection of these figures shows that all of the operative parts are really the same, the change being a mere change of location, without affecting the functions of those parts.

In "2-Release", the parts are in a released position, and both the main valve (black) and the emergency valve (red) are closed.

In figure "2-Service", the piston has taken its "preliminary" traverse. The main valve (black) has been shifted so as to close the release port from brake cylinder to atmosphere (green), and the port from auxiliary reservoir to brake cylinder (red line and red arrow) is being opened.

The emergency valve (red) remains closed.

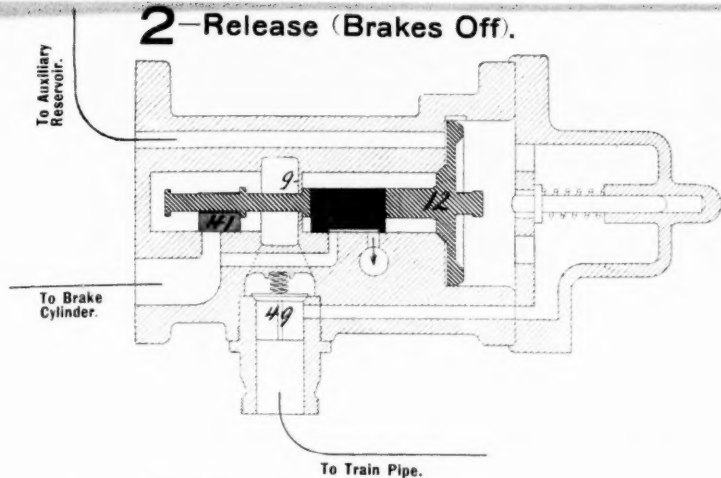
The third figure shows the "quick action" of the brakes.

The piston has made its extreme traverse. The main valve (black) and the emergency valve (red) have both been *pulled* off their respective ports. Auxiliary-reservoir air (red line and red arrow) enters through its *restricted* aperture slowly. Train-pipe air (blue line and blue arrow) asserts a preponderating pressure on the check valve, which consequently opens, and train-pipe air rushes through the large aperture to the brake cylinder.\*

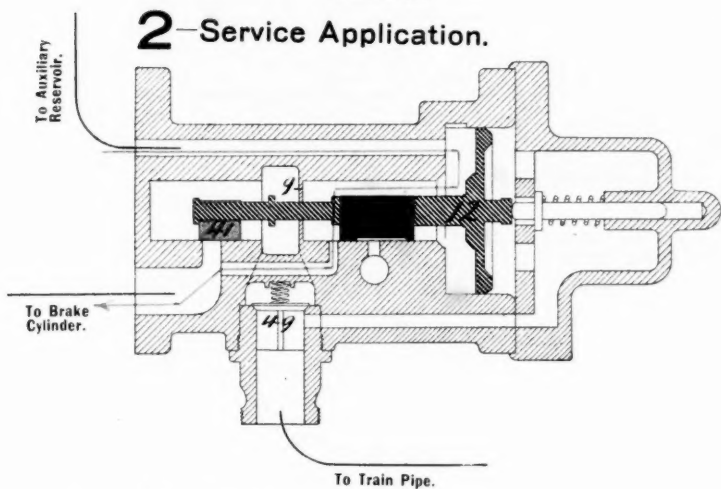
We see by these diagrams that the position of the emergency valve

\* All forms of "quick-action" triple valves necessarily involve *some form* of a wall or partition between auxiliary reservoir air and the direct passage for train-pipe air. It will be observed, by inspection of diagram 2, that the change in the location of the "emergency" or "quick-action" valve 41, from the one side of the piston (*opposite* to the side upon which the main valve is situated, as in diagram 1) to the other side of the piston (the *same* side as that of the main valve, as in diagram 2), involves the use of a "partition" (9), and the "restricted" passage for auxiliary-reservoir air must be *through* it or *around* it; otherwise, the continual presence

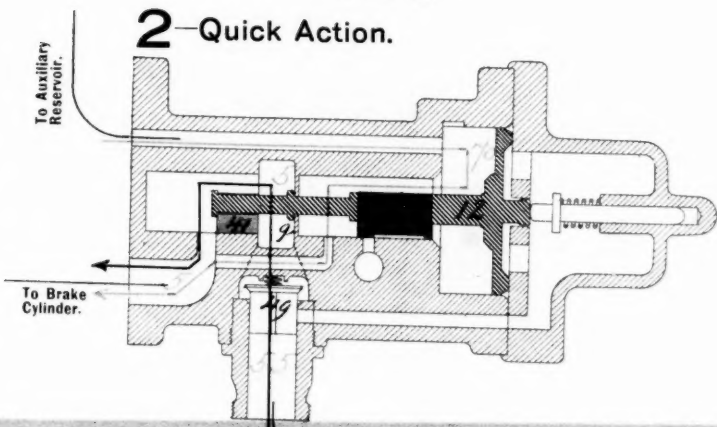
## 2-Release (Brakes Off).



## 2-Service Application.



## 2-Quick Action.





(red), on one side of the piston or the other, is immaterial to the invention of Patent No. 360,070. The position may be better in one case than in the other or not, but there is no change of function, nor of the way in which the functions are performed. The change involves a mere change in the form and location of the passages and of the valves.

But let us proceed a step further, and consider whether the *form* of the emergency valve (red) itself is material.

In the two prior diagrams, the emergency valve (red) has been shown as a "slide valve."

Is a "*slide* valve" essential to the contrivance?

Diagram 3, on the opposite page, tends to show that it is not.

In this diagram, the only substantial change that has been made is the change in the emergency valve (red), from a "slide valve" to a "plug" or "poppet" valve. Said valve no longer *slides* from its seat; it is *lifted* from its seat. There has been a change in the arrangement and location of the air passages, caused by the change in the form of valve and the way in which it seats itself, but there is no change of substance.

The parts operate, in all essential particulars, in precisely the same way, as will be evident upon a brief examination of the respective figures; and cause both "service" application and "quick-action" application in the same way as when a "slide" emergency valve is used.

If the changes in form and location of the parts, illustrated in diagrams 1, 2 and 3, are not such as to substantially differentiate the structures therein shown from the Westinghouse invention of Patent No. 360,070, claims 1, 2 and 4 (as we may easily see), then neither (as we shall show) are the changes of form and arrangement embodied in the defendants' valve.

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of auxiliary-reservoir air, at higher pressure, in the passage containing the "quick-action" valve, would prevent the flow of train-pipe air into and through this passage when the "quick-action" valve is opened. Boyden's "partition," hereafter considered, is, therefore, a mere incident to the location of the "emergency" valve in his structure, viz., upon the opposite side of the piston from that of the Westinghouse. The partition is numbered 9, wherever it appears in this form.

In considering the question of infringement, especially in connection with the first and fourth claims, let us consider the contention of the defendant, that all that they have done is to adapt an old form of triple valve to quick-action work, *without providing* it with any auxiliary "quick-action" valve.

Bear in mind, still, that the Westinghouse Patent is not limited to a particular form of triple-valve structure.

The quick-action invention may, as he contends, be engrafted upon, or caused to be embodied in, *any* of the various known forms of triple-valve structures.

Now, the defendants contend that what they started with, when Boyden proposed to modify a triple-valve structure so as to make it capable of "quick action," was an old form of "triple," and one devised by Westinghouse himself.

The Westinghouse Patent No. 141,685, dated August 12, 1873, is concededly the *form* of triple valve upon which Boyden worked, in constructing the valve complained of.

See Church's evidence, Record, pp. 623, 624.

What Boyden really did, as we now hope to show, was to modify the structure of Patent No. 141,685 (1st) by altering the "main valve" of Patent No. 141,685 in shape; (2d) by providing an "additional valve," which should act to admit train-pipe air direct to the brake cylinder; (3d) by changing the location and direction of the air passages so as to admit train-pipe air.

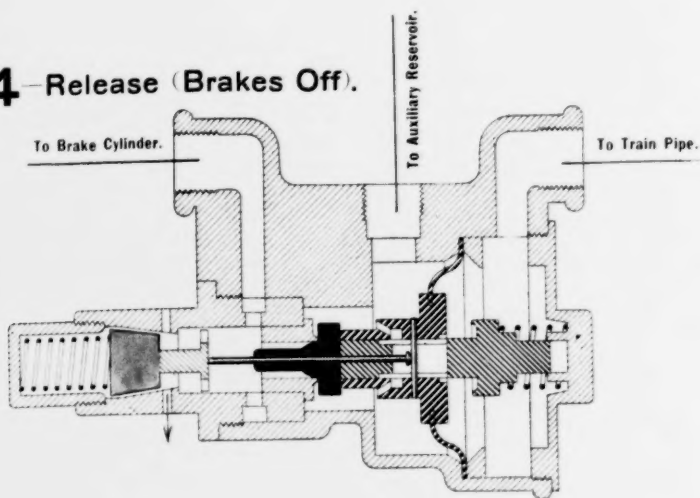
That this was the real character of the changes will, we think, be apparent from an inspection of the following diagrams, in which each of these changes are shown as separately introduced, so that their real character will be better understood.\*

The Boyden valve in controversy is represented by diagram 14, opposite page 41, and this diagram represents the three characteristic positions of the parts of the valve, viz., the "release" or "brakes-off" position, the "service" position (for ad-

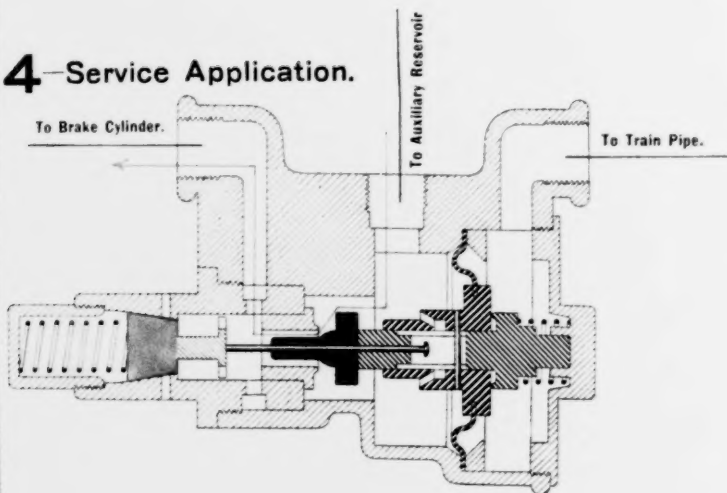
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\* It is to be understood, of course, that these diagrams, also, are not a part of the record, but are illustrations which perhaps more easily convey to the mind a realization of what the defendants really did than would a description in mere words.

#### 4—Release (Brakes Off).



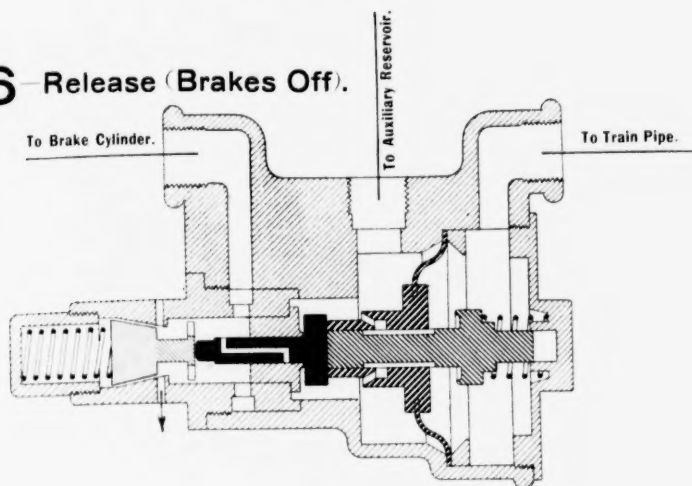
#### 4—Service Application.



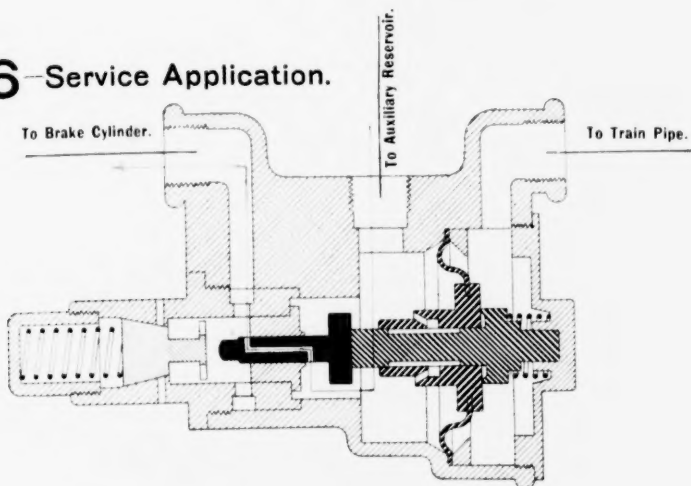




## 6—Release (Brakes Off).



## 6—Service Application.





mitting auxiliary reservoir air), and the "quick-action" position (for admitting, also, direct train-pipe air).

In diagram 4, opposite the preceding page, will be found the plain triple-valve of Patent No. 141,685 (with unnecessary details omitted).

As this valve was capable of admitting only auxiliary reservoir air to the brake cylinders, two positions only are shown, viz., 4—"release" position and 4—"service application" position, in which auxiliary reservoir air is admitted either partially and gradually, or fully, according to the extent to, and length of time during, which the "main valve" (black) is pulled off its seat.

Starting with these figures, illustrating the valve of Patent No. 141,685, the *real* nature of the changes that Boyden has made, to convert this valve into a "quick-action" valve, will be easily comprehended, if they be considered one by one.\*

These changes may be enumerated as follows :

FIRST. The defendants have changed the form of the "main valve" (black) from a "plug" form of valve to that of a "stem slide valve." This change is illustrated in diagram 6, on the opposite page, which shows two positions of the valve of Patent 141,685,<sup>1</sup> modified merely by altering the "plug" form of "main valve" into a "sliding stem valve" and changing the ports in it,

\* It is to be noted, in passing, that Patent No. 141,685 shows that it was not a new expedient of Boyden's to cause the *release* of air from the brake cylinder to the atmosphere to be effected by a valve (green) *separate* from the "main-valve" (black).

In some of the old forms of Westinghouse triple, as, for instance, in the form shown in Patent No. 220,556, and in the form shown in Patent No. 168,359 or 172,064, the "main-valve," itself, is provided with an aperture which enables it to do the work of "releasing;" but in the earlier patent of Westinghouse, No. 141,685, the release-valve (green) is separate from the "main-valve" (black), and is located at the left side of the structure.

This is the position and arrangement of the parts embodied in the defendants' valve, and is adverted to simply to show that the change of position of the "release" valve is not one which affects the present controversy.

A similar change of position of the "release" valve used in connection with the "quick-action" valve of Patent No. 360,070 (the patent in suit), without any change of function, is illustrated in diagram 12, opposite, behind diagram 6.

for the admission of auxiliary reservoir air to brake cylinder, so that they become operative by being drawn out of the bushing or casing which surrounds said "main valve" (black).

If the aperture through the valve be *partly* uncovered, there will be a *partial* admission of air, just as when the plug main-valve of diagram 4 is only slightly lifted.

It is clear that, so far, there has been no *substantial* change from the structure of Patent No. 141,685. It does exactly what it did before, but does it by means of the movement of stem "slide" valve *through* its bushing, instead of by the *withdrawal* of the "plug" valve from its bushing or seat.

SECOND. What next may be done to the structure of Patent No. 141,685 ?

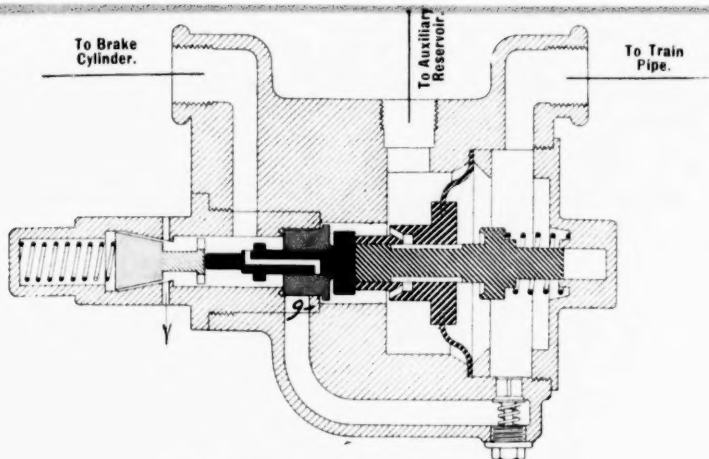
A NEW VALVE may be added, which opens when the piston (or diaphragm) makes its EXTREME stroke. This is shown in diagram 7, on the opposite page.

Here, as will be seen, the bushing, or casing, of the main-valve (black) of diagram 6 has been converted into a *separate valve* (of the "plug" variety), and the extreme or "further traverse" of the diaphragm, or piston, has been caused to pull the said plug-valve off its seat, by means of a collar behind it (see lower figure, "Quick-Action"), and to thus open a *larger passage* than before to the brake cylinder.

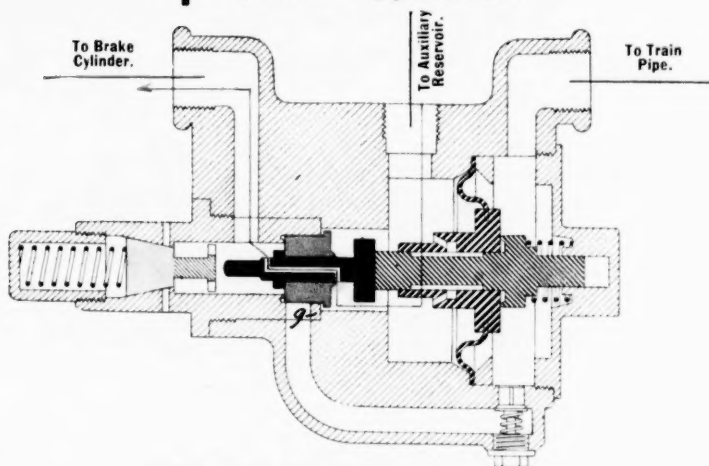
A short, or "preliminary," traverse of the diaphragm (or piston) does *not* unseat the new valve (see second figure), but allows the apparatus to work as it did in the form shown in diagram 6.

THIRD. This alteration of the structure, so as to provide a new valve, has been accompanied by a *change of air-passages*, so that the NEW VALVE will be operative, *when* opened, *to admit train-pipe air* to the brake cylinder.

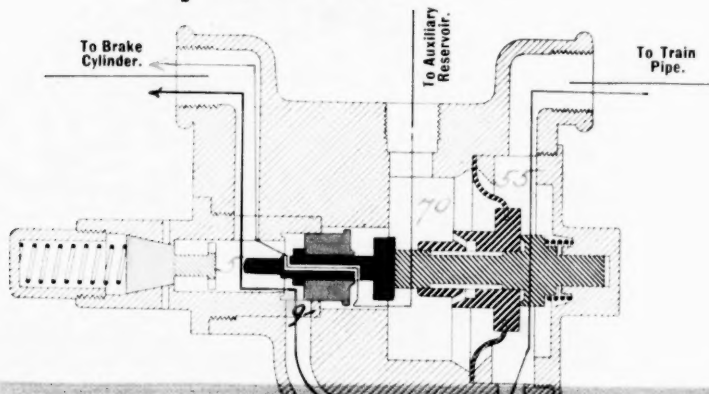
Train-pipe air (indicated by the blue line and blue arrow) then passes directly from the train-pipe, through the check-valve and under the left side of the emergency-valve (red), to the brake cylinder.



## 7—Service Application.



## 7—Quick Action.





A partition, at 9, prevents any interference with the flow of the train-pipe air through the new passage thus opened.

The difference of air-pressures, on opposite sides of the check-valve, causes said check-valve to open (just as in the Westinghouse structure of Patent 360,070). The passage for auxiliary reservoir air is so small, that, while such air passes in sufficient quantities for *service* application of the brakes (or for graduating), it cannot pass in sufficient quantity to maintain equal pressure on both sides of the check-valve, *when* the new emergency-valve (red) is opened, and, hence, the check-valve *then* opens and admits train-pipe air.

Diagram 8, on opposite page, shows the partition 9 merely moved further to the right, and, as this position would cut off the flow of auxiliary-reservoir air for "service applications," a small aperture must now be made through it, as shown.

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NOTE. Another way of looking at Boyden's changes in the valve of Patent 141,685, is that he has *changed* the plug "main valve" of that patent into an "Emergency" or "Quick-Action" valve, by providing that it can be opened *only* by the *extreme traverse* of the piston, and by *altering the air passages*, through the insertion of a partition, so that the opening of the valve will admit *train-pipe air* to the brake cylinder; and then, by forming *another valve* out of the *stem* of the original main valve, to admit auxiliary-reservoir air to the brake cylinder for "Service" work. But this comes to the same thing.

This change in the character of the air passages (caused by changes in the location of the partition and making in it a small aperture) is not materially different from the arrangement of air passages shown in the patent in suit, No. 360,070, as will, we think, be apparent from an inspection of the preceding diagrams.

Diagram 9 shows the valve of diagram 8, modified in form, by simply making the emergency (red) valve a *lift* valve (instead of a *plug* valve), and by arranging the air passage from train pipe to brake cylinder so as to go *through* the triple-valve piston, or diaphragm, instead of *around* it. THIS MAKES THE DEFENDANTS' VALVE.

Can any one doubt, after inspecting these diagrams, that the Boyden structure is really the structure of Patent No. 360,070, *under a mere change of form*.

Let us, then, again enumerate these changes, understanding that a mere change of form is immaterial, so far as any departure from the essential features of Patent No. 360,070 is concerned.

FIRST. The release valve (green) has been altered in position so that the "release" is no longer effected by the movement of the main valve (black), as in Patent No. 360,070. It is now effected by the movement of a separate valve (green) at the left-hand of the structure, as illustrated in Westinghouse Patent No. 141,685.

SECOND. The "main valve" (black) for admitting auxiliary reservoir air to the brake cylinder and applying the brakes has been changed in form from a "plug" valve to a "sliding stem valve" (see diagram 6).

Clearly this is an immaterial change, so far as Patent No. 360,070 is concerned.

THIRD. A new valve has been made (diagrams 7 and 8) around, and supplementary to, the stem slide valve, which opens a larger passage of the brake cylinder. This valve opens only on the extreme traverse of the piston.





1

FOURTH. A new air passage (diagrams 7 and 8) has been provided, direct from train pipe to brake cylinder, which is normally closed (during "service" application of the brakes) by a spring check valve, but which is opened (when "quick action" of the brakes is desired) by reason of the fact that train-pipe pressure, on one side of said check valve, preponderates over the slowly admitted pressure from the auxiliary reservoir, upon the other side.

This new passage, which is closed by the check valve, is, in the Boyden valve, located in the centre of the triple-valve piston or diaphragm, whereas in the Westinghouse Patent No. 360,070 the new passage is located *around the edge* or side of the triple-valve piston or diaphragm.

This difference in location of the new air passage is clearly immaterial, as is seen by a comparison of the diagram 9 (which represents the valve of Patent No. 141,685, modified so as to provide a direct passage from train pipe to brake cylinder *through the centre* of the triple-valve diaphragm or piston, as in the Boyden valve), with the diagram 8, which represents the new passage *around the* triple-valve diaphragm or piston.

FIFTH. The *new* valve, which controls or governs the *new* air passage, is one of the "lift-valve" variety instead of one of the "plug valve" variety.

This difference is clearly immaterial, as is seen by a comparison of diagram 8 with diagram 9, and simply results from the change of location of the new air passage, from the side of the triple-valve piston (or diaphragm) to the centre.

The allegation that Boyden has done something substantially new by inserting a *partition*, having a small aperture in it, to restrict the flow of auxiliary reservoir air, for the purpose of obtaining such a difference in pressure on opposite sides of the quick-action check valve as to result in the opening of said check valve, when quick action is desired, is wholly unfounded as a matter of fact.

It is true that the restricted aperture is *in a different place* in the Boyden valve from what it is in the valve of Westinghouse Patent No. 360,070, but this is simply due to the location of the emer-

gency valve and of the emergency air passage, and not to any difference in the plan or mode of operation.

The Westinghouse Patent itself expressly refers to the restriction of the opening for the admission of auxiliary-reservoir air, and to the effect of such restriction upon quick action, in the following words (Westinghouse Patent No. 360,070, Record, p. 788) :

"The feed opening for the admission of air from auxiliary reservoir to the brake cylinder is *purposely* made of comparatively small diameter, it having been determined by experimenting that the initial application of the brakes should not be made with maximum force, and this opening may be made of such size as to apply the brakes exactly in accord with the requirements of the most efficient working."

That the differential pressures, on opposite sides of the quick-action check valve, are the same in the Boyden structure as in the Westinghouse structure of Patent No. 360,070, and that this difference in pressure is due to the restriction of the air passage from auxiliary reservoir to brake cylinder, is fully explained by the complainant's witnesses.

(See Newbury, Record, p. 163, Q. 205 ; Barnes, p. 195, Q. 230 ; Barnes, p. 373, Q. 672 ; p. 374, fol. 580 ; p. 377, fols. 584-5 ; Westinghouse, p. 287, Q. 417.)

As Mr. Westinghouse says (R., p. 288),

"The presence of restricted air passages, for the purpose of creating momentary differential air pressures, is required for the same purpose in the defendants' structures as in that shown in Patent 360,070, and it does not exist in any different degree in any of these structures."

(4) *The First and Fourth Claims are infringed.*

If we have now correctly explained the defendants' valve and its mode of operation, and have correctly indicated the changes which the defendants have introduced in developing the old Westinghouse triple of Patent No. 141,685 into a "quick-action" valve, we shall be prepared to consider the other claims of Westinghouse Patent No. 360,070 ; viz., the first and fourth.

Those claims are in the following words :

"1. In a brake mechanism the combination of a main air-pipe, an auxiliary reservoir, a brake cylinder, a triple valve, and an aux-

*iliary valve device, actuated by the piston of the triple valve and independent of the main valve thereof, for admitting air in the application of the brake directly from the main air-pipe to the brake cylinder, substantially as set forth."*

"4. The combination, in a triple-valve device, of a case or chest, a piston fixed upon a stem and working in a chamber therein, a valve working within the piston stem and governing ports and passages in the case leading to connections with an auxiliary reservoir and a brake cylinder and to the atmosphere, respectively, and an *auxiliary valve actuated by the piston stem and controlling communication between passages leading to connections with a main air pipe and with the brake cylinder, respectively, substantially as set forth.*"

We have italicized those parts of the claims which are in controversy.

Clearly, the defendants' valves have all of the features of both of these claims. They have "an auxiliary valve device actuated by the piston of the triple valve" (first claim), or "actuated by the piston-stem" (fourth claim).

It makes no difference that in one case the triple-valve piston *pushes* this auxiliary valve off its seat and opens the new passage to brake cylinder (as in Patent No. 360,070), nor that in the other it *pulls* such a valve off its seat and opens a similar passage (as in the Boyden structure).

Nor does it make any difference that, in Patent No. 360,070, the "stem," which opens the auxiliary valve, is on the right side of the piston, while, in the Boyden structure, it is on the left.

The auxiliary-valve device is also as "independent" of the *real* "main valve" in the Boyden structure, as it is in the Westinghouse structure.

In both cases, the auxiliary valve is moved by the triple-valve piston and the stem attached thereto, and in each case there is an "independent," quick-action valve, *i. e., independent*, in the sense that there is a "main valve" which does the "service work" of admitting auxiliary reservoir air to the brake cylinders when service work only is required, and another valve which does "quick-action" work by admitting train-pipe air to the brake cylinders when quick action is required.

Even if it were true, as the defendants contend, that, under certain special circumstances, and by special and careful manipulation, the valve 22 (red) of the Boyden structure can *also* (in *some* cases, and by "careful" manipulation) be made to admit only auxiliary-reservoir air to the brake cylinders, yet it is none the less true that such valve is *principally useful* for "quick action," and is "independent" of the sliding stem valve, which is *mainly*, and to the extent of from 90 to 95 per cent., relied upon for "service" work.

Can the defendants escape the charge of infringement if they have a valve which performs "quick action" work, and which is clearly "auxiliary" to, and "independent" of, another and separate valve, which performs at least some (and, as we prove, the principal, if not all of the substantial, part of the "main valve" work), merely because, by some special manipulation, and under some special circumstances, that auxiliary and independent valve can also be made to do some "main valve" work?

The defendants' auxiliary or "quick-action" valve is clearly independent of *one* "main valve," and this, as we show, and as the Circuit Court below held, the *principal* one.

The Court of Appeals were clearly in error (*Rec.*, p. 881, *foot*) when they said that the *principal* function of valve 22 is to do "main-valve" work (*i. e.*, to admit auxiliary reservoir air to the brake cylinder), and that its "quick-action" work is only incidental. *The contrary is true.*

Differences between valves, more marked than those here involved, were disposed of by this Court as immaterial, in *Consolidated Safety Valve Co. vs. Crosby*, 113 U. S., 157.

In that case, the Court said :

"There is one structural difference between the two valves, which is now to be mentioned. In the Richardson valve, *all* the steam which escapes into the open air escapes from the huddling-chamber, through a stricture which is smaller than the aperture at the ground joint. In defendants' valve, the valve proper has two ground joints, one at the inner periphery of the *annulus*, and the other at its outer periphery, and *only a part of* the steam, namely, that which passes through one of the ground joints, passes through the huddling-chamber, and then through the stricture; the other part of the steam passing directly from the boiler into the air through the other ground

joint. But all of that part of the steam which passes into the huddling-chamber and under the extended surface, passes through the construction at the extremity of such chamber, in both valves; the difference being only one of degree, but with the same mode of operation."

\* \* \* \* \*

"When the ideas necessary to success are made known, and a structure, embodying those ideas, is given to the world, it is easy for the skillful mechanic to vary the form by mechanism, which is equivalent, and is, therefore, in a case of this kind, an infringement."

### **The defendants' stem slide valve is not the sensitive graduating valve of Patent 220,556.**

It remains to consider one contention urgently pressed by the defendant, and which had the qualified approval of the Circuit Court (Judge MORRIS) (Record, p. 844), and, possibly, of the Circuit Court of Appeals (Record, p. 882).

That contention is that the stem slide valve 18, with its apertures, *i, j, k*, of the Boyden structure, is essentially the sensitive poppet valve, inside the "main valve," of the Westinghouse Patent No. 220,556, and hence (as alleged) that the valve 22 of the Boyden structure is only the "main valve" (under a change of form) of the Westinghouse Patent No. 220,556, and prior Westinghouse patents.

The Circuit Court (MORRIS, J.) said on this subject, as follows (p. 844):

"It is probably true that in the Boyden mechanism, the stem valve *i, j, k*, which I take to be the equivalent of the sensitive graduating valve shown in the Westinghouse Patent No. 220,556, October 14, 1879, is so constructed that it may do, *and probably in most cases does do, the work of ordinary breaking*; that is to say that by two or three successive applications of pressure through that smaller and more sensitive valve the brake cylinder is filled and the main valve 22 becomes non-essential, or, if lifted off its seat, is moved very gently; but valve 22 will, if the engineer uses his brake valve *carefully*, do the work of a main valve, as is demonstrated, I think, by the experiments in which the sensitive graduating valve *i j k* was plugged up. So I take it that defendant's valve *i j k* must be held to be the sensitive graduating valve usual in triple-valve devices since the Westinghouse Patent No. 220,556; and the defendant's valve 22 must be considered to be the main valve, and that in defendant's mechanism he has been able, by an ingenious arrangement,

restricting the admission of auxiliary-reservoir air to the triple-valve chamber, to cause the main valve to do both main-valve work, when needed, and to do quick-action work when needed.

"As, by the explicit terms of Claims 1 and 4, Westinghouse has restricted himself, as to those claims, to an auxiliary valve, independent of the triple valve, I hold that the defendant does not infringe those claims.

The Court of Appeals dealt with the subject more briefly (R., p. 882), in the following words :

"We think the Circuit Court was correct in its view that the poppet valve 22 of Boyden is the original main valve of 220,556."

Are those views correct ?

We note the exact position taken by the Circuit Court, and, apparently, approved by the Circuit Court of Appeals.

It was conceded that the stem-valve *i j k* "is so constructed that "it may do, and probably *in most cases* DOES DO, the work of preliminary braking"—*i. e.*, "service" work—and hence that, generally, the so-called "main valve 22 becomes non-essential" *for that purpose*, and that it is only in case the engineer uses his brake valve "carefully" that the valve 22 *can ever* do "main-valve" work.

That it *so* worked *at all* (even under the exceptional circumstances stated), Judge MORRIS, and apparently the Circuit Court of Appeals, thought was demonstrated by working the Boyden valve with the apertures *i j k* *plugged up*—that is, by rendering *inoperative* the very valve features which, it was conceded, did "main-valve" work "in most cases." The other valve *could then* be made to do "main-valve" work.

But this so-called demonstration, by which the defendants convinced the courts, was very misleading as to the real character of the valves.

The character of a valve (say, the valve 22) is determined by what it does in the structure as actually organized—not by what it does when that organization is materially altered. In the defendants' structure there are obviously two valves; one, the valve *i, j, k*, which, as is conceded by the Courts, does "main valve" work "in



most cases," and, as is apparently conceded, in *all* cases, *unless* the engineer be "careful."

The other is clearly the valve which is *always relied upon* to do "quick-action" or emergency work whenever such work is required.

Is this latter valve 22 any the less a "quick-action" emergency valve, auxiliary to, and independent of, the "main valve" of the triple, because, in a few cases, and by a careful manipulation, it may also be made to supplement the "main valve" work, ordinarily done by the other valve?

If the defendant uses two valves, and one of them be an "emergency valve" and independent of the other, does it make any difference that the emergency valve, while independent of one main valve, for *emergency* work, can be made, on short trains or in exceptional cases, also to do supplemental main valve work?

The Courts below were misled by not giving careful attention to the wording of the Westinghouse claims. They thought that those claims required "an auxiliary valve independent of the triple valve" (Record, p. 485), and as defendants' "emergency" valve was in the case of the triple, they supposed that it could not be the emergency valve of the patent.

What the claims did really require were: An auxiliary valve "actuated by the piston of the triple valve and *independent of the main valve* thereof" (First Claim).

Or, merely,

"An auxiliary valve actuated by the piston-stem" (Fourth Claim).

If the defendants' valve 22 was, as is conceded, really an "auxiliary" valve, and actuated by the piston stem, and adapted for doing, and actually doing, "quick-action" work, as auxiliary to another valve which was relied upon "in most cases" for doing "main-valve" work, the substance of the fourth claim is clearly found.

And, if such auxiliary valve be independent of *even one* "main valve," especially of the one which does main-valve work "in most cases," we have also the substance of the first claim.

But Judge MORRIS and the Court of Appeals were mistaken in supposing that the stem valve *i j k* of the Boyden structure was the equivalent of the "sensitive graduating valve" of the Westinghouse Patent No. 220,556.

As this patent plays an important part in this case, and as its special feature was, in some respects, misapprehended both in the Circuit Court and in the Court of Appeals, a brief statement of its nature will be here attempted.

In this patent, illustrated in the accompanying figure (opposite page 75), which is taken therefrom (Rec., pp. 737-8), Westinghouse shows an air brake which takes power, for *all* conditions of use, from the auxiliary reservoir.

It did *not* use "train-pipe air" at all for the direct purpose of filling the brake cylinders and applying the brakes. The piston of the triple valve actuated a slide valve, known as the "main valve," whose principal office it was to admit air directly from the auxiliary reservoir to the brake cylinder.

A partial or slight traverse of the piston moved the slide or "main" valve a short distance, and caused it to uncover a small aperture leading to the brake cylinder.

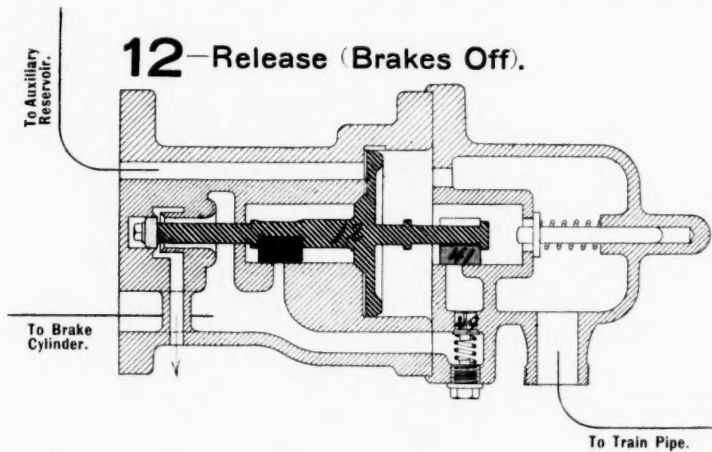
A long valve movement, or traverse, admitted a somewhat larger amount of auxiliary reservoir air. As already explained, these passages could not, for constructive reasons, be large.

The Circuit Court of Appeals (in the opinion now sought to be reviewed) spoke of this patent as follows (R., p. 874):

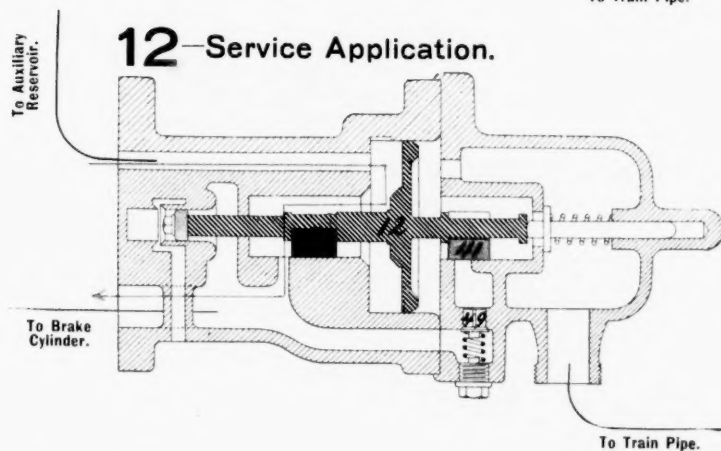
"A study of patent 220,556 will show that compressed air driven by the engineer into the train-pipe passed through the triple-valve of each car to its auxiliary reservoir; *that there was no vent for this train-pipe air into the brake-cylinder except through the auxiliary reservoir, and that this vent from the auxiliary reservoir to the brake-cylinder ordinarily occurred when the triple-valve piston had made but a partial movement or traverse in its chamber.* The text and diagram of 220,556 shows that *even a full or extreme traverse of the piston in its chamber would vent no other compressed air into the brake cylinders, except from the auxiliary reservoirs.*

"The device embraced in patent 220,556, valuable and efficient as it is and was for ordinary work on all trains, with the triple-valve piston in partial traverse, and for emergency work on short trains with the triple-valve piston in extreme traverse; *yet it failed to meet*

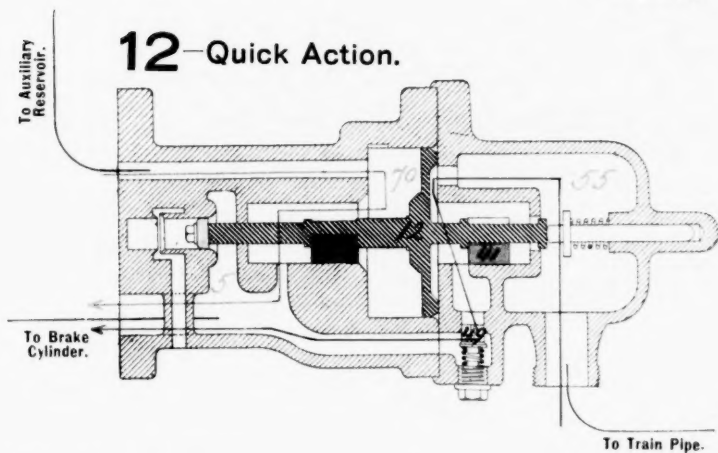
## 12—Release (Brakes Off).

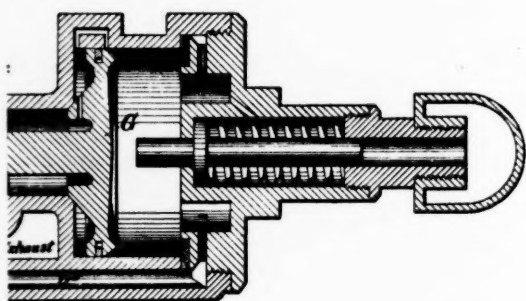


## 12—Service Application.

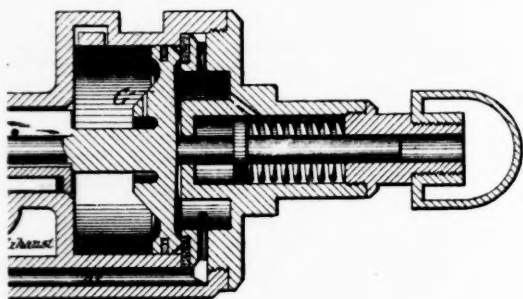


## 12—Quick Action.





②



③

*the requirements of the service for emergency work on long trains of fifty large freight cars. For the latter work it was found insufficient in practice, the insufficiency consisting in not acting with sufficient promptitude. It is not for us to explain why the passage of compressed air exclusively from the auxiliary reservoirs to the brake cylinders was not sufficiently prompt on long freight trains. It is assumed in the briefs and testimony that the mechanism of this patent did not suffice for this work. It is admitted on both sides that while the mechanism of 220,556, though effective for the ordinary purposes of braking trains, such as stopping them at stations, slowing them in passing switches and other points requiring continuous movement, and checking them on descending grades, yet that it was not effective for abruptly stopping long trains in sudden emergencies.*

But, in addition to the "main" slide valve for uncovering the openings from auxiliary reservoir to brake cylinder by different lengths of movement of the triple-valve piston, there was, in Patent No. 220,556, a subordinate feature of construction to insure greater accuracy.

It was this subordinate feature which was the subject matter of the claims of Patent No. 220,556.

The nature of this feature it is important to understand accurately, because the defendants have based their contention, that their steam valve *i j k* is the equivalent of this sensitive poppet valve, on, what we now hope to show to be, an erroneous view of its character.

A brief review of prior patents of Westinghouse will make this clear.

The admission of auxiliary reservoir air with different (although always LIMITED) rapidity, dependent upon the size of the opening uncovered, from auxiliary reservoir to brake cylinder, was old.

Thus, the Westinghouse Patent No. 168,359 (R., p. 752) describes a triple valve (shown on opposite page), the piston of which operates a slide valve H, which, according as the piston is moved to a greater or less extent, uncovers, to a greater or less extent, the passage *e* to the brake cylinder from auxiliary reservoir.

The patent says (R., p. 754) :

"The position of the piston G in its chamber *a* is regulated chiefly by variations of air pressure on its opposite sides, and, by lessening or increasing slightly the air pressure in *a* below the

piston, the position of the piston may be changed at pleasure, and with it, of course, the valve H."

"It will be observed that the valve H has at  $h^2$  a length and breadth of face such that it may entirely cover the port  $e$ . Hence, the piston G may be brought down so that, while entirely closing the supply port  $s$ , it shall bring the valve H to a position where it shall uncover only a small part of the port  $e$ , or any desired part."

Patent of Westinghouse No. 141,685, dated August 12, 1873 (R., p. 736), illustrates (as already seen) another form of triple valve, in which the "main valve," for fully or partially opening communication from auxiliary reservoir to brake cylinder, is not of the "slide" valve variety, but is of the "poppet" or "plug" valve variety.

This patent "has more particular reference to the construction of devices by which a flow of compressed air from each auxiliary reservoir to its brake-cylinder can be regulated at pleasure, and thereby the brakes be applied with any desired degree of force less than the maximum."

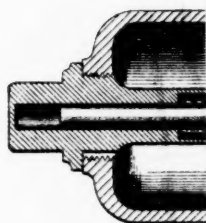
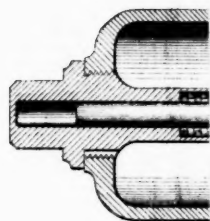
The patent shows a triple valve, operated by a "diaphragm,"  $u$  (which is a well-known equivalent of a "piston").

The movement of the diaphragm, by reduction of pressure on the other side, causes a tapering "plug" valve  $o$  to open to a greater or less extent, according as the diaphragm is moved, communication to the brake-cylinder.

The patent says (R., p. 738) :

"The area of the opening through the port  $o^1$  is regulated by the distance which the plug  $o$  is caused to move vertically upward. Hence, if the pressure be reduced but slightly at  $G^2$ , the plug  $o$  will be raised but a short distance, and a small amount of compressed air or other fluid will be allowed to pass through and out at the port  $H^1$ . \* \* \* By the use of the taper plug  $o$  in the manner described, and by regulating, as can easily be done by the use of suitable cocks, the amount of pressure in the upper and lower parts of the chamber  $G^1$ , it is easy to regulate the amount or density of the air which is permitted to flow through the port  $o^1$  into the brake-cylinder, and consequently easy to regulate and adjust at all times the force with which the brakes are applied, and such force may be varied from the maximum power of the brakes down to the fractional part of a pound in excess of ordinary atmospheric pressure."

It will be perceived, therefore, that long prior to the date of Patent 220,556 Westinghouse had devised several forms of "main







valves " which, by the greater or less extent to which they uncovered an opening or openings into the brake-cylinder (depending upon the extent to which the triple-valve piston moved), regulated at will the amount of auxiliary reservoir air which was admitted to such cylinder.

In the *slide-valve* varieties of triple valve, however (such as those described in the Westinghouse Patent No. 168,359, and in the later patent of the same variety, dated January 11, 1876, No. 172,064 (R., p. 757), there was a lack of certainty in getting to any definite position desired, especially when *slight* variations of pressure only were employed. This was due to the fact that the main valve H was a *slide valve*, and was *subject to air pressure from above* which tended to hold it to its seat.

In Patent No. 220,556 Mr. Westinghouse dealt with the difficulty of operating *such a slide valve* by providing it with an interior auxiliary valve of the "poppet" variety, which could be moved more quickly and with much less pressure than the slide valve itself, and, hence, could be used to regulate the admission of air *after this main slide valve had been once shifted*, without requiring the *main valve* to again move at all.

Patent No. 220,556 (R., p. 762), says :

" It is important in such device that the valve (lettered H in said two patents and herein) which governs the flow of air or other fluid, shall move not only with great certainty to any desired position but also shall move with slight variations of pressure on the piston (lettered G), so that the application of the brakes with any desired power and their ready release may be quickly and easily effected at the pleasure of the engineer.

" To this end I combine with the said valve H, giving it a slight range of motion on its stem, an auxiliary valve operated by the same stem in such manner that a portion of the functions performed in said patents by the valve H may now be performed by such auxiliary valve, the latter moving with practically no resistance, and hence moving more quickly and with less pressure than the valve H itself. The same auxiliary valve is also designed for use under certain circumstances as a leakage valve."\*

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\* These drawings (which are the same as those in the patent, Rec., p. 762) show the parts moving in reverse direction from the corresponding parts of the other drawings and diagrams presented. This will not produce confusion, if borne in mind.

Attention to the drawings and description of Patent No. 220,556 clearly shows the function and operation of this "auxiliary valve," which moves with practically no resistance, because, unlike the main valve, it is not a slide valve nor exposed on one side to air pressure, but is a "poppet."

It is to be noted, however, that this "poppet" valve cannot be used to open communication between auxiliary reservoir and brake cylinder, *until after* the "main" slide valve has moved.

The slide valve H must itself *first* move so as to cut off the opening from the brake cylinder to the open air or exhaust, and *also* so as to open, either partially or fully, communication from the auxiliary reservoir to brake cylinder.

But, *after* this communication has once been opened, either partially or fully, *then* the small interior auxiliary or poppet valve  $e^1$  can be closed or reopened again, by slight movements of the piston, *without requiring any movement of the main valve H itself.*

The patent says (p. 764) :

"When now the valve H is thus shifted, so that the port  $s$  shall, to the extent of one-quarter or one-half its capacity, more or less, as is usual when less than a maximum braking force is desired, be thus brought into communication with the port C, and held there until the limited or desired amount of fluid pressure shall have passed into the brake cylinder, *the auxiliary valve  $e^1$  becomes available as a quick and ready means of closing the supply port with certainty, without danger of opening the exhaust.* To this end, a very slight increase or excess of pressure below the piston G—much less, in fact, than is necessary to shift the valve H—will suffice to move the piston G and stem  $g$  far enough to close the valve  $e^1$  on its seat  $e$ . All ports are thus closed by an almost instantaneous motion, and the brakes remain on with a force corresponding to the amount of pressure previously charged into the brake cylinder.

"In case a slight addition to the operative braking force is desired, either to compensate for loss by leakage or for any other reason, it may be secured by a slight downward motion of the piston G, such as will unseat the auxiliary valve  $e^1$ . In this manner the graduating function may be more advantageously performed than heretofore."

And again (p. 765) :

"But with the explanation already given, it will be seen that the necessity of giving a back stroke to the valve H is wholly obviated, so far as relates to closing the ports and holding in the brake-

cylinder any predetermined or limited amount of fluid pressure, or to increase such pressure at pleasure, *since after the slide-valve H has been brought to the desired position*, as set forth, a slight motion imparted to the piston G, and much less than would be necessary to start the valve H, will suffice to seat and unseat the auxiliary valve  $e^1$ , and so hold or retain in the brake cylinder any desired pressure previously charged therein, or permit the increase thereof at pleasure."

The function, therefore, of the auxiliary "poppet" valve  $e^1$ , *in the slide valve H*, for the purpose of remedying its lack of sensitiveness and its excessive friction, will now, we think, be clearly understood. This auxiliary valve has no function in *initially*, or *without movement* of the "main" valve, opening access from auxiliary reservoir to brake cylinder.

Although it is unseated as soon as the piston G commences to move, yet it admits no air to the brake cylinder, until the slide valve H itself has been moved into the position which uncovers the port  $s^1$  leading to the brake cylinder.

*After that has once been done, then* this auxiliary poppet valve can be used to close the access to the brake cylinder, without again shifting the slide valve H, or to re-open that communication, without such shifting.

It will thus be seen that the addition to the prior art in air brakes, which was made by Patent No. 220,556, was supplementing a main *slide valve* by an interior poppet valve.

The "sensitive graduating valve" of said patent was a "poppet" valve, working inside of the main slide valve, and there used, because *that kind of slide valve* was slow when delicate action was required. This poppet valve was brought into operation, *only and solely, after* the main slide valve had been shifted to open communication to the brake cylinder.

Now, there is no such construction in the Boyden apparatus, and no need of any such construction.

In the operation of the Boyden structure, the stem slide valve *i, j, k*, must move *first* and, *generally*, is the *only* valve that moves in "service" work.

It is that valve, and that alone, which initially moves to open, and does open, communication from the auxiliary reservoir to brake cylinder.

The valve 22, which surrounds the valve  $i j k$ , is *not* the true "Main Valve", because it does *not* move *first*, and can not move *at all* (to admit *auxiliary* reservoir air) *until after* the brake cylinders have been substantially filled through the ports  $i j k$ .

To consider valve 22 of Boyden the equivalent of the *Main Slide Valve* of Westinghouse, and the sliding stem valve 18 of Boyden, with its port  $i j k$ , the equivalent of the supplementary poppet valve of Westinghouse, is a view which is the very reverse of the construction illustrated in the Westinghouse Patent No. 220,556.

In that patent, the main slide valve opens communication from the auxiliary reservoir to brake cylinder *first*, and it is *only after it has moved* that the interior sensitive poppet valve can be brought into operation at all; and its first movement must then be to close the passage to the brake cylinder—not to open it.

In the Boyden structure, on the contrary, the valve 22 does not move *at all*, until *after* the brake cylinder has been substantially filled with air admitted by the apertures  $i j k$ .

The Boyden structure has, therefore, no sensitive interior poppet valve for closing and reopening communication, after a main slide valve has been shifted (which is the *only* function of the *poppet* valve of Patent 220,556), because it has no need of any such valve.

The Westinghouse structure of Patent No. 220,556 needed an interior sensitive poppet valve, because its "main valve" was a slide valve, *with air pressure on one side*, holding it to its seat and producing friction. The Boyden slide valve is a stem slide valve, *having equal air pressures on all its sides*, and, consequently, it moves freely.

The valve 22 of the Boyden structure is not the equivalent of the "main slide valve" of the Westinghouse Patent No. 220,556, because it is not relied upon to do main-valve work. The valve  $i j k$  confessedly does such work "in most cases." The valve 22 does not do such work at all, except when the engineer is "careful,"





and, as already shown, if it can ever be done, it is only *possible* to do such work on the *front* cars of a long train.

Under such circumstances, it is not "*the* main valve." It is a "*quick-action*" valve, auxiliary to, and independent of, the *real* "main valve."

### **The Second Claim of Patent No. 360,070 is not "Fatally Defective."**

The ruling on this point by the Circuit Court of Appeals is in the following words (Record, p. 880) :

"We think that when claim 2 of 360,070, in its language describing the action of that device, failed to describe any means by which the extreme traverse of the piston produced it, declaring merely that the piston, 'by a further traverse admits air directly from the main air pipe to the brake cylinder,' it was fatally defective, claiming only a result which is public property and not identifying the specific means (his own property), by which the result is achieved."

\* \* \* \* \*

"But where the inventor falls so far short in his description as to claim only the result which his machine accomplishes, and omits an explicit definition of the *means* by which he does it, as in the case at bar, the Courts have another duty to perform, one which they owe to the public and to the worthy fraternity of inventors, and must decline to give him general rights where he is entitled only to special rights."

We submit that this ruling was entirely incorrect, in holding that Mr. Westinghouse had failed to adequately describe the means by which his result was accomplished.

It is not the office of a claim to *describe* the means. The specification does that. The claim is intended to "*specifically pointed out*" which of the many parts, necessarily *described* in giving a full explanation, are the *essential* features of the invention.

When the claim states, as it does, that the "preliminary traverse" of the piston "admits air from the auxiliary reservoir," and that the "further traverse" of the piston "admits air directly from the main air-pipe to the brake cylinder, substantially as set forth," it refers back to the specification; not, it is true, for a

*slavish* adoption of the *identical* instrumentalities there described but for an understanding of the essential and substantial features of the means therein illustrated.

"Substantially as described" means not *literally* as described, nor *identically* as described, but "substantially as specified in regard of the combination which is the subject of the claim."

*Lake Shore Co. vs. Car Brake Co.*, 110 U. S., p. 229.

The specification describes, as already seen, certain features of the structure, which confer upon it its new capacity, under the control of the engineer, viz.: (1) the *double* traverse of the piston, (2) a passage, or way of access, directly from train pipe to brake cylinder, and (3) a valve which *controls* that passage.

These features are the essential features of the "means" by which the triple-valve piston, in its "further traverse," acts to perform its function of admitting air directly from the train pipe to brake cylinder.

The form and location of the passage and the shape of the valve and of the *intermediate* connections, are obviously non-essential, and may be varied within wide limits.

A patentee is not, as we understand it, bound, especially where his patent is one of a pioneer character, to limit himself to the mechanical connections by and through which the essential instrumentality, for producing motion, acts upon the instrumentalities for producing the specific result.

The fact that the claim omits to specify, and is not in fact confined to, the specifically illustrated and described connecting mechanism, by and through which the "further traverse" of the piston of the triple valve opens the valve which admits train-pipe pressure to the brake cylinder, does not make the claim "fatally defective;" nor does it enable an infringer, who varies the form of the connecting means, or substitutes other mechanical means, to escape infringement of the claim.

This has been so recently and unanimously ruled in this Court as to need no elaboration.



In *Deering vs. Winona Harvester Works*, 155 U. S. 286, 302, this Court said (p. 302) :

"Defendants further insist that the twentieth claim of this patent is invalid, by reason of the fact that, if the board *d*<sup>1</sup> be construed, as it evidently must, as a board pivoted to the butt adjuster, the combination is incomplete and inoperative, because the means by which it is held and controlled are not stated in the claim. \* \* \* *Admitting that additional elements are necessary to render the device operative, it does not necessarily follow that the omission of these elements invalidates the claim, or that the precise elements described in the patent as rendering it operative must be read into the claim.* If Steward were, in fact, the first to invent the pivotal extension to a butt adjuster, he is entitled to a patent therefor, though the infringer may make use of other means than those employed by him to operate it (*Loom Co. vs. Higgins*, 105 U. S., 580, 584).

"In such case *any appropriate means* for making it operative will be understood. Otherwise, the infringer might take the most important part of a new invention, and, by changing the method of adapting it to the machine to which it is an improvement, avoid the charge of infringement.

"The invention of a needle with an eye near the point is the basis of all the sewing machines used, but the methods of operating such a needle are many, and if Howe had been obliged to make his own method a part of every claim in which the needle was an element, his patent would have been practically worthless. We think it sufficiently appears that Steward was the inventor of the pivoted extension described in the twentieth claim; that the claim is valid and was infringed by the defendants.

"We agree, however, that the defendants made use of a different method of adjusting this extension, which is neither the same invented by Steward nor a mechanical equivalent of the same. We hold, therefore, that the twenty-first claim was not infringed."

The same principles were applied by the Circuit Court of Appeals to a later and less important patent of Westinghouse for an air brake, No. 376,837, and those principles are still more applicable to the earlier and more important patent in suit.

In that case, the Court said (*Westinghouse vs. New York Air Brake Co.*, 63 F. R., pp. 962-969) :

"but the particular means by which this pressure was to be permitted to exert itself, whether continuously or only when a port should be opened, do not constitute an essential part of the invention. Means must necessarily be shown in the specifications, but the identical means or the special devices were not, in the language of *Machine Co. vs. Lancaster*, 129 U. S., 263; 9 Sup. Ct., 299, 'necessary constituents' of the invention, either in the specification or in

the claim. The skill and mechanical ingenuity of constructors of locomotives can, as will be seen hereafter in the examination of other patents and of the infringing devices, arrange different details of mechanical construction by means of pistons, valves, ports and springs, which, adopting the supplemental chamber system first conceived and embodied by the patentee, and a kindred but not precisely the same mechanical method for the movement of the piston, will accomplish the same result. \* \* \* A Court would not be justified in adopting 'a narrow or astute construction' which would minimize the character of the invention, leave its real scope open to trespassers, and thus 'be fatal to the grant.'

In the very late case of *Taylor vs. Sawyer Spindle Co.*, 75 F. R., p. 310, a similar contention of the existence of a "fatal defect" was urged by the defendants, but the Circuit Court of Appeals for the Third Circuit (Judges ACHESON, WALES and GREEN) overruled such defense, saying :

"As a further defense it is contended that the claims sued on must be construed as containing the sleeve whirl, in which case they are not infringed, because the defendant does not use the latter, *or else they have no operative mechanism and are void.*"

"The law on this subject is too well settled to be open for discussion. A patentee is not required to claim the entire machine in each claim. Each of the claims of issue is for a complete combination of the spindle and its supporting tube and devices, and there was no necessity for expressing in terms the devices for revolving the spindle. Any appropriate means for operating it will be understood. The omission of the sleeve whirl *does not affect the validity of either one of the claims*, which belong to that class where reference may be made in the specification to supply in a claim what is plain to any one skilled in the art, is a necessary incident (*Reese Button Hole Co. vs. Globe Button Hole Co.*, 61 F. R., 970 ; *Deering vs. Harvester Works*, 155 U. S., 286)." (The italics are ours.)

### **Variance from Former Decisions Upholding this Claim.**

Our first assignment of error relates to a conflict between this adjudication that Claim 2 is "fatally defective" in matter of form, and an adjudication made by the Court of Appeals in the Second Circuit.

This latter adjudication was made by a "*Per Curiam*" decision of the Court last named (69 Fed. Rep., 715), affirming the allowance of a preliminary injunction by Judge LACOMBE (65 Fed. Rep., 99) under the identical claims here in suit—claim 2 being one of the claims which Judge LACOMBE particularly discussed.\* That the Court of Appeals in the Second Circuit adopted Judge LACOMBE's entire decision as to said claim 2, fully appears from the "*Per Curiam*" decision as rendered :

" We agree with the Court below that the defendant's apparatus " is an infringement of the first, *second* and fourth claims of Patent " No. 360,070, and *deem it unnecessary to add anything to the opinion* " of Judge Lacombe " (69 Fed. Rep., 715).

It goes without saying that the allowance of an injunction under any particular claim, and the affirmance thereof on appeal, necessarily implies that, in the view taken by the Court, as to such claim, it was not "fatally defective," nor even *materially* defective.

And the detrimental results, not only to the patentee, but also to the business interests of the railway public, which must follow such a conflict of adjudications, was not the least of the reasons why this Court is asked to review that which is believed to be the erroneous decision.

**The Court of Appeals erred, in deciding that the grant of a patent to Boyden, subsequent to the patent in suit, was a decision by the Patent Office upon the question of infringement, and entitled to great respect.**

What the Court said on this subject was as follows (Record, p. 879) :

" This question [of infringement] was presented necessarily to the Patent Office of the United States when Boyden applied for a

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\* Since this brief was written, the Circuit Court for the Southern District of New York (LACOMBE, J.) has rendered a decision on final hearing (*Westinghouse Co. vs. New York Co.*, Oct. 13, 1896), *reciting the variance* in the decisions of the two Circuit Courts of Appeals, but *upholding* the Second Claim as *valid* and infringed.

patent for the device under consideration. That office employs the best experts in mechanics which it can secure in this and other countries. Its examinations are, indeed, *ex parte* in form, but they are, nevertheless, conducted under hot and skilled contestation in every case of importance; and its decisions, though not conclusive, are entitled to great respect. That office, after full examination, awarded a patent to Boyden on the 16th day of August, 1892, for his quick-action improvement on the device of Patent 220,556, and that action by the office was, in effect, a ruling that the Boyden device did not infringe Westinghouse's quick-action Patent Number 360,070. That ruling takes rank here as the testimony of experts of the highest experience, skill and knowledge in mechanics. That ruling was subsequent to the issuing to Westinghouse of both the Patents Numbers 360,070 and 376,837, four years after the later patent, when the Patent Office had full knowledge of them."

It is not true, as matter of fact or matter of law, that the Patent Office "employs the best experts in mechanics which it can secure "in this and other countries."

Under a system of promotion, regulated by the rules of our civil-service system, ninety-six examiners are employed, at salaries ranging from \$1,400 to \$2,500 per annum (Rev. Stat., Sec. 440).

Whether such low salaries, under our civil-service system, can command the services of the "best experts," etc, is too doubtful to constitute properly a part of an adjudication as to valuable rights of property.

The ruling that the examinations made in the Patent Office, though "*ex parte* in form," "are nevertheless," as stated in the extract above quoted, "*conducted under hot and skilled contestation in every case of importance*," is wholly an error. The only contests which can possibly take place in the Patent Office, under any Act of Congress now in force, are in interference cases, and Boyden and Westinghouse were never in interference. All other cases are *ex parte*, the proceedings therein are secret, and as to them no contest can possibly arise.

These errors, though comparatively small in themselves, lead up to two other errors, both of which are material.

By the grant of a later patent to Boyden, it is stated, in the extract above quoted,

"that the action by the Office was, in effect, a ruling that the "Boyden device *did not infringe* Westinghouse's quick-action "patent number 360,070."

And at that time—that is, at the time this Patent Office action was taken—it will be remembered, this case and this question were then pending in the Circuit Court.

And while so pending, the defendants procured, on the usual *ex parte* applications, the grant of the three several patents already recited, in which they inserted various statements, argumentative and otherwise, as to the relationship of their device to the Westinghouse Patent 360,070, and apparently for the express purpose of using such *ex parte* statements as evidence in their own behalf.

Nor can this ruling of the Court of Appeals be put aside as mere *obiter dicta*, and therefore of no binding force as an adjudicated precedent. Exactly the reverse is true. It is an adjudication as to the proper legal effect of certain evidence, which, with rare exceptions, is introduced into every patent case which is ever tried. Defendant almost invariably has a patent, good or bad as it happens, and defends under it. And this adjudication, made by a court of last resort, unless reversed or corrected, will be binding as such throughout the Fourth Circuit, and more or less controlling as an authority in the other circuits.

*The question of infringement, under the law, does not belong to the Patent Office, and, until the present decision was rendered, it has never been so held.*

The ruling or decision thus made, and stated with such freedom from ambiguity, coming as it does from a Court ordinarily, in Patent cases, of last resort, is *alarmingly dangerous* to the interests of inventors and patentees everywhere, and is *most dangerous* to those inventions which possess the *highest merit*. What would this Court have said, if it had been asked to decide, in the Telephone cases, that, by the grant of later patents to Dolbear, or to Drawbaugh, or to Edison, or to Gray—and granted *while suits for infringements were pending*—the Patent Office had made a ruling that the Dolbear, or the Drawbaugh, or the Edison, or the Gray telephone "*did not infringe*" the prior Bell

Patent? We mean no disrespect to the Court whose decision we are now calling in question, by saying that, as we understand the law, such a holding is simply revolutionary. If such be the law, then the use of the Patent Office for the purpose of presenting, if not for manufacturing, testimony, to prove an issue upon which the prior patentee cannot be heard upon his own behalf, hereby enjoys the highest judicial sanction which it can possibly receive outside of this Court, and in the hands of the infringer becomes an implement of easy use by which to make, in all cases, a perfect defense. All he has to do is to apply for and procure, at a cost of \$35, a later patent for some further detail of improvement, real or pretended. He can *assert*, in his application, that his "improvement" or "modification" is not an infringement, etc. As the Patent Office has no jurisdiction of the question of infringement (except, of course, in interference cases, and then only for the purposes of the grant), such assertions in a specification are generally allowed to go unchallenged, and are left for the Courts to pass on. The *claim* is usually scrutinized—nothing else is (100 U. S., 671-2). Then, no matter how limited the claim, or how trivial the invention, the later patentee, *by merely getting a patent*, obtains, under the decision now in question, an *ex parte* ruling, not merely that his device involves some patentable additions to, or modifications of, the prior patent, but that it departs so essentially from the *claims* of the prior patent that it does not embody its essential features at all—or, in other words, that it *does not infringe*. By the mere grant of a patent so procured, he would have, under Judge HUGHES' decision, a ruling by the Patent Office of *non-infringement*, which he could properly use as a defense.

Such a defense, so made, has thus been held not merely to raise a *prima facie* presumption that the later patent involves some patentable differences from the prior patent, but that its grant, though not conclusive, is *prima facie*, at least, sufficient as a defense; and this ruling has been made by a Court of last resort; and, if the error be not corrected, it will work irreparable injury, alarming both

in amount and extent, to the most meritorious inventors of our nation, or of the world.

The facts, upon which this singular decision was made, are correctly stated by Judge MORRIS in his decision, and his ruling thereon may properly be quoted here as being substantially correct in its application of the law to those facts. Judge MORRIS (66 F. R., 1006, 1007) says:

"It is further urged that in a doubtful case the scale should be turned by the fact that, subsequent to the date of the patent in suit—indeed, more than two years after the institution of this suit—Patents Nos. 481,134 and 481,135, August 16, 1892, were granted to Boyden for the mechanism now used by the defendant.

"Boyden was entitled to patents for whatever was a patentable novelty in the devices by which he was able to make his valve 22 answer for both service and quick-action work in connection with the restricted passage B, and for any other patentable novelty in the forms of his mechanism. The widely different forms in which he has illustrated his devices in the two above-mentioned patents show that—taking what Westinghouse had discovered and demonstrated to be the underlying principle of a quick-action brake—a skillful and inventive mechanic can devise many forms for applying it.

"But, in his specification of Patent No. 461,135, Boyden alleges that his device differs essentially from Westinghouse's Patent No. 360,070, and involves a new mode of operation. *The question whether it does or does not was the very question then pending in this suit*; and, so far as the Examiner passed upon it, in allowing the specification to stand, he did so upon the *ex parte* application of Boyden and unassisted by testimony as to the state of the art at the date of the Westinghouse Patent, and without testimony as to the scope of the Westinghouse quick-action invention and its great importance and merit, and, therefore, without the opportunity of judging whether or not it was a pioneer invention of a fundamental character, entitled to construction co-extensive with the invention, or was simply a patent for an improvement in a known art, to be restricted to the form of the device shown in the model and illustrations."

"The determination of that question is the starting point in the consideration of the controversy, and, in my judgment, the fact that Westinghouse was the first discoverer of the vital underlying invention should turn the scale in his favor."

Contrasting with this the ruling made by the appellate tribunal, it is respectfully, but urgently, submitted that an error, in its probable results so fraught with danger to the most meritorious



inventors known to the law, should not be allowed to pass without correction ; and this is the only Court where it can be authoritatively corrected.

Not only is it true that the Patent Office has no authority to decide, or even pass on, a question of infringement for the Courts, but it is equally true that the Patent Office is not authorized to make or create testimony for the Courts.

While the decision herein complained of does not go to the extent of holding that a Patent Office ruling is *binding* on the Courts, and, in fact, says that it is not "conclusive," it does give to such ruling an effect which, to say the least, has no foundation in law, and also is highly pernicious. In the sentence next following the clause last quoted, Judge HUGHES says of this Patent Office ruling that it "takes rank here as the testimony of experts of the highest experience, skill and knowledge in mechanics."

It would seem to be almost needless to suggest that, if a subsequent improver on a pioneer invention can, by the mere *ex parte* act of procuring a subsequent patent, especially *after being sued*, make or create "testimony" for himself—and testimony which may "take rank" in a Federal Court as that "*of experts of the highest experience, skill and knowledge in mechanics*"—then one of the great safeguards erected for the protection of patented property is entirely destroyed. *On mechanical questions the law knows no higher testimony than that which is thus defined ; and hence, when such testimony is furnished, it cannot successfully be rebutted.*

And if this be a correct statement of the law, then, in patent cases, under the issue of infringement, the Courts will have little to do (except in cases of *manifest error*) but to register and enforce the *ex parte* rulings of the Patent Office.

*Miller vs. Eagle Manufacturing Co.*, 151 U. S., 186, stated the rule that the grant of the later patent merely raised "a *prima facie* presumption" of the existence of a "patentable difference" in the later patent (p. 208). But a "patentable difference" does not negative the charge of infringement.



In other branches of the case, this Court distinctly declined to follow and apply a ruling of the Patent Office as to the existence of patentable difference between two patents issued by the Patent Office (p. 202).

It has often been ruled that an apparatus is none the less an infringement because it embodies an improvement, and has been patented as such.

The decision of the Circuit Court of Appeals of the Fourth Circuit goes far beyond any decision of this Court in attributing weight and value to the *ex parte* rulings of the Patent Office.

The decisions heretofore made by this Court are believed to be in strict accord with the views we are seeking to present.

The question arose in *Blanchard vs. Putnam*, 8 Wall., 420. Mr. Justice CLIFFORD, in rendering the opinion of the Court (p. 426), said :

" Attempts are often made in the trial of patent cases to introduce such collateral issues on the question of infringement, but they are irregular and cannot be sanctioned, as the only proper comparison on that issue is of the defendant's machine with that of the plaintiff, as prescribed in the pleadings. What the jury have to determine is, does the machine of the defendant infringe the machine of the plaintiff; and, if it does not, then the defendant is entitled to a verdict; but, if it does infringe the plaintiff's machine, then the plaintiff is entitled to his remedy, and it is no answer to the cause of action to plead or prove that the defendant is the licensee of the owner of another patent, and that his machine is constructed in accordance with that patent.

" Controversies between litigants in court cannot be completed in that way, nor should the plaintiff be subjected to such outside issues, as he is clearly entitled to a verdict when he has proved that he is the original and first inventor of his improvement, and that the defendant has infringed his patent."

The present case comes exactly within the rule thus stated, in these essential features :

- (1) A pioneer patent to complainant.
- (2) A structure or device made by defendant.
- (3) An issue of infringement raised thereby.
- (4) A later patent under which defendant claims to be working.
- (5) A case for final disposition, not for the preliminary injunction.

Under these facts and conditions, *Blanchard vs. Putnam* says that the patent under which defendant claims to be working is not admissible in evidence *at all, under the issue of infringement.*

Later cases which *look like* modifications of this rule, relate, for the most part, if not entirely, either to some side or collateral issue, or else are exceptional in their nature.

In *Boyd vs. Tool Co.*, 158 U. S., 260, neither party was a pioneer, and both applications were pending at the same time—a very different case.

In *Parcement Co. vs. City of Elizabeth*, 4 Fish., 189, cited in *Boyd vs. Tool Co.*, the question arose *on a motion for a preliminary injunction.* In such proceedings, presumptions sometimes count as evidence, and hence a patent to defendant is worth something in support of a presumption.

But on final hearing, or what is practically the final disposition of a case, mere presumptions do not count for much. And even in *Miller vs. Eagle Co.*, it was merely referred to as a confirmatory consideration, and then only as of a *prima facie* character.

In *Woolensack vs. Reiher*, 115 U. S., 96, the effect to be given to a Patent Office decision arose under a question of reissue. More than two years had elapsed between the date of the original patent and the date of the reissue. Proofs satisfactory to the Commissioner of Patents had been submitted to the Patent Office, so as to account for the delay, and the Commissioner, being satisfied with those proofs, had granted the reissue. These facts were set up in the bill. Defendant demurred, and the Supreme Court, in sustaining the demurrer, after reciting the facts as above stated—that is, the decisions which had been made on the proofs so submitted—added the following (p. 101):

“ But this does not satisfy the law. The question as to whether the delay had been reasonable or unreasonable is for the Court to determine, upon the special circumstances brought to its attention, *and it cannot substitute the decision of the Patent Office upon that question for its own.*”

Hence it is believed that the law of *Blanchard vs. Putnam* is still the law of the land. And even if the later decisions cited *supra*

have tended to modify it, it has never been modified as applicable in a suit on a pioneer patent, and, still further, has never been so far modified that a grant of a patent beomes "testimony of high rank" as establishing non-infringement in a Federal Court, and, still more so, when the later patent is not procured until more than two years after suit is brought.

It is submitted that the effort to raise *ex parte* departmental decisions to, practically, the rank of adjudications, which are authoritative as "testimony" in Federal Courts of last resort, embodies so great and dangerous an error as to create an unusually urgent call for the intervention of this Court, by the exercise of its statutory powers of review.

And it is also submitted that the decision rendered hereon by Judge MORRIS, as quoted above, is substantially correct and should be affirmed.

**Patent Office Proceedings, in the Application for  
Patent 360,070, Contain Nothing Which Require  
Any Other Than a Broad and Liberal Construc-  
tion of the Claims Here in Issue.**

The particular form of embodiment of the Westinghouse quick-action invention, shown and described in Patent 360,070, contains an emergency valve which is *not integral* with the main valve of the triple valve; that is to say, the two are not made of one and the same piece of metal. But Mr. Westinghouse was fully aware of, and recognized, the fact at the time, that whether the two valves were made integral or non-integral (that is, of one piece of metal, or two pieces of metal) was wholly immaterial, and he stated this fact in his specification, as originally filed. Thus, he said (Rec., p. 714):

"Further, while in the specific construction described and shown, the function of admitting air from the main pipe is performed by a valve separate from that which effects the preliminary admission of reservoir pressure to the cylinder, a modification in which the same office is performed by a valve integral with the main valve and

formed by an extension thereof, would be included in and embody the essential operative features of my invention."

This application was filed November 19th, 1886.

Under date of January 14th, 1887, the Patent Office wrote a letter, running as follows (Rec., p. 717, fol. 1172) :

" Claims 1 & 2 are anticipated by patent No. 280,285 to G. A. Boyden, June 26th, 1883 (steam & air brake attachments).

" It is desirable that a working model of the triple valve be furnished."

Claim 1, which was thus objected to, read as follows (Rec., p. 714, fol. 1166) :

" 1. In a brake mechanism the combination of a main air pipe, an auxiliary reservoir, a brake cylinder and a triple valve provided with a device for admitting air directly from the main air pipe to the brake cylinder, substantially as set forth."

This claim did not, in terms, as do the claims in suit, point out that the " device " is one for producing " quick action," nor that it is operated by the movement of a triple-valve piston.

This action of the Patent Office led to a re-examination of the claims as drawn, and it was then found that, while claim two was not open to objection, claim one was, *under the literalism of its terms*, broad enough to cover certain pre-existing *automatic-brake* mechanisms, but which, confessedly, did not *produce quick-action*. *In its literalism*, it was met by Mr. Westinghouse's own patent of 1875, No. 168,359—a patent issued ten years before quick-action was even thought of. And the Boyden Patent, which was cited, No. 280,285, was equally barren of the invention in dispute, as Mr. Boyden himself has testified in the present case (Rec., p. 497, Q. 8).

Thus, on account of a failure to distinguish, in express words, the quick-action invention from previously patented mechanisms which confessedly did *not* contain quick-action, the original first claim was erased and the present first claim was inserted. Also, disclaimer was made of the subject matter of Patent No. 280,285 (Rec., p. 717, fol. 1173 and p. 720, fol. 1177).

Thus, the technical objections to the issue of the Westinghouse Patent, as formulated in the Patent Office letter of January 14th, 1887 (Rec., p. 717, fol. 1172), were wholly obviated.

But another objection seems to have been found, which, though put in writing by the Patent Office Examiner, was made the occasion of another amendment. It appeared that the unwritten rules of Patent Office practice forbade the description, in a specification, of modifications which were not illustrated in the drawings. This rule was merely for the convenience of the Examiners in making their examinations, since they chiefly used the drawings for this purpose, and a modification, though described in the specification, was liable to be overlooked if not illustrated in the drawings. Besides, whether a proposed modification was or was not a mechanical equivalent, was a question which belonged to the Courts and not to the Patent Office. If it was an equivalent, it would come within the scope of the claim, by operation of law.

And, upon the Examiner calling attention to the rule of Patent Office practice, above referred to, the above-quoted reference to an *equal valve*, as capable of being used in lieu of a separately made valve, was erased from the Westinghouse specification.

*Hogan, Rec., pp. 277-280.*

Thus, three, and only three, amendments were made.

1st. A claim, which was inadvertently so phrased that by its generalism it covered or included a pre-existent *non-quick action* brake, was erased as soon as the error was discovered, and a claim which *excluded* such *non-quick-action* brake was substituted therefor.

2d. The prior patent cited by the Office (Boyden, No. 280,285 of 1883), and admitted by Boyden himself to be *non-quick-action*, was disclaimed.

3d. Under one of the technical requirements of the Patent Office, no assurance was made of *the description* of a possible modification, simply because the drawings of the patent did not contain a view or picture of such modification,—thus leaving that modification to be controlled, if at all, by the doctrine of equivalents.

The 2d in number of these three amendments is not regarded as a fact of importance, either by the Circuit Court or by the Court of

Appeals, and hence may be disregarded ; but as to the other two, the 1st and 3d, the Court of Appeals gives to them a scope and effect much beyond what we believe to be required by law, and equally beyond the strictest requirements of any equitable considerations which can be presented.

And, in their discussion of this part of the case, the Court of Appeals unhesitatingly awards to Mr. Westinghouse the highest possible rank as a pioneer inventor. Thus the Court says (Rec., p. 880, fol. 1419) :

"That this invention of Westinghouse, thus undefined, is one of the highest value to the public, and that it is a pioneer one in the art of quick-action air brakes is not denied, and is conceded. It is conspicuously one of those pioneer inventions which entitle the proprietor to a liberal protection from the Courts in construing the claim."

Continuing in the same liberal tone, the Court states clearly and forcibly certain favorable rules of construction which are to be applied in support of a pioneer invention (*Ibid*).

"If an inventor is ambiguous or obscure, or halt or limp in his language of description the Courts will help him out and so construe the claim as to give distinct identity to his device. If there be a doubt in the mind of the Court or of a jury on the issue of mechanical equivalency the Court will give and instruct the jury to give the benefit of the doubt to the pioneer inventor."

Thus far we have but little to except to. But the next sentence which, for convenience of reference, we designate as (A), and the two following paragraphs which, for like reason, we designate as (B) and (C), are, in their relationship to this case, open to comment. They run as follows (Rec., pp. 881, 882) :

(A) "But where the inventor falls so far short in his description as to claim only the result which his machine accomplishes, and omits an explicit definition of the *means* by which he does it, as in the case at bar, the courts have another duty to perform, one which they owe to the public and to the worthy fraternity of inventors, and must decline to give him general rights where he is entitled only to special rights."

(B) "The inventor in the present case seemed himself to feel that his claim was too broad in terms. In his original application for patent 360,070 his first claim was couched in this language : 'In a brake mechanism, the combination of a main air pipe, an auxiliary reservoir, a brake-cylinder, and a triple valve provided with a device

admitting air directly from the main air pipe to the brake-cylinder.' This language covered *any device* which might accomplish the object mentioned, and he found it necessary to erase it from his specification, and to substitute claim 1 as it now stands."

(C) "In the same specification Westinghouse had also used this language: 'Further, while in the specific construction described and shown, the function of admitting air from the main pipe is performed by a valve *separate* from that which effects the preliminary admission of reservoir pressure to the cylinder, a modification in which the same office is performed by a valve *integral* with the main valve and formed by an extension thereof, would be included in and embody the essential operative features of my invention.' Here again is a claim for a function irrespectively of the mechanical means used in accomplishing it, which the inventor found it necessary to erase from his specification. In the suit at bar he virtually asks the court to restore to his claim the two erasures which he felt himself unable to sustain at the Patent Office. Our duty to the public and inventors at large forbids our doing so."

The first, (A), of these three extracts is, in substance, a repetition of the ruling previously made as to claim 2—that it is "fatally defective," etc. We have discussed this point elsewhere (*supra*, p. 10), and have there shown, as we believe, (1) that claim 2 is *not* a claim for "*only the result*," and (2) that it *does* contain a sufficiently explicit designation of "*the means*," and (3) that, under the invention question—"conceded" by the Court of Appeals to be "*one of the highest value to the public*" and "*a pioneer one in the art of quick-action brakes*"—Mr. Westinghouse is entitled not merely to the limited "*special rights*" which that Court is willing to give him, but also to those "*general rights*" which are co-extensive with his invention.

The extract (B) contains very little that requires comment. We cite it, in passing, merely to point out the fact that this ruling contains nothing which even tends to limit the construction of either claim 1 or claim 2 *in accordance with their terms, and with the award of each of the full benefit of the doctrine of mechanical equivalents*.

We come now to the extract above designated as (C), and herein our fifth assignment of error, as submitted with the petition for a writ of *certiorari*, is in point, the same reading as follows:

"FIFTH. As further matter of error herein, and as a matter irreconcilably at variance with the ruling of the Circuit Court of Appeals in the First Circuit, your petitioners further submit that manifest error was made by the said Circuit Court of Appeals for the

Fourth Circuit in holding as matter of law that *the mere erasure* from the original specification of a description of a proposed modification operates as a *disclaimer* of such modification."

It is believed that the following considerations are controlling :

1. We have already explained why this erasure was made—merely in compliance with a technical rule of the Patent Office that, not being separately illustrated in the drawings, it could not remain in the description. The *act* of erasure cannot have any efficiency, beyond the *reason which required it*. The erased matter was not alleged to be *untrue* ; hence there can be no presumption, from mere erasure, that it was otherwise than true. And if true *then*, it is true *yet*.

2. The truth of the matter so erased has never been called in question, either by any testimony introduced into this case or in any other way. And its truth being universally admitted, it logically follows that the *integral valve* is, in fact, the mechanical equivalent of the separate valve, and therefore, as such, comes within the scope of the valve.

3. Erasure and disclaimer are two different things. In no respect are they synonymous. In this case, Mr. Westinghouse, under rules of Patent Office practice, was not allowed to state a certain fact in a certain way—the truth of the fact not being questioned. The fact remained true, and Mr. Westinghouse remained at liberty to assert and maintain its truth at all other times and places. He was simply not permitted, for technical reasons, to state it *then and there*. Hence he erased it.

To convert this into a disclaimer, such as to deprive Mr. Westinghouse of any right therein, there must be on his part some further act of renunciation or disavowal, in respect of the thing referred to in the erased matter, such as would create an estoppel.

His right to the integral valve, as a mechanical equivalent of the separate valve, is a *property* right which the law gives him, and of which the law will not divest him by mere inference or implication.

4. This exact question arose recently in the Court of Appeals, First Circuit, and it was there decided by an elaborate and exhaustive opinion, that a mere erasure is *not* a disclaimer.



*Reece Button-Hole M. Co. vs. Globe Co.*, 21 U. S. Ap., 244 :

The discussion of this particular question, in the case thus cited—too long to be here quoted in full—will be found at pages 369-373 of 21 U. S. App. Briefly, it is to the effect that the rule of *Leggett vs. Avery*, 101 U. S., 256, as to cases where broad claims are made, rejected and erased, and *narrower claims are inserted, or where positive disclaimers are made*, is that, in such cases, the limitations thus voluntarily placed on the scope of the patent by the patentee ought not to be and cannot be disregarded by the courts ; but that, while this is true, it is also true that the rule ought not to be extended to the mere erasures or alterations (1) which are made as to matters of detail, or (2) which, under Patent Office practice or usage, are required for making the specification conform to the drawing, and (3) least of all should such rule be extended and applied to what are known as "pioneer" patents—one of which the Westinghouse confessedly is. The Supreme Court, so far as our search can discover, has never as yet extended the *Leggett vs. Avery* rule to any one of the class of cases last above referred to, and two Circuit Courts of Appeals have decided that it ought not to be done—one in the *Reece* case, and the other in a case presently to be cited.

From the *Reece* case (*supra*, p. 370), we extract two short sentences which indicate the conclusion reached by that Court :

"Nevertheless, it defeats the very essence of this rule to extend it to what was inserted inadvertently, or to push the construction of what was thus inserted in one direction, when it is plain from the whole transaction that the parties inserting were looking in another."

\* \* \* \* \*

"Courts ought, therefore, to be the more careful, under circumstances like those at bar, to give a patentee the benefit of all the equities which can be raised in his behalf by any reasonable implication from what appears on the face of the amendments, or from the transaction as it passes through the Patent Office."

And this limitation of the *Leggett vs. Avery* rule, as formulated in the *Reece* case, is approved, adopted and applied by the Circuit Court of Appeals in the Sixth Circuit.

*McCormick Harvesting M. Co. vs. Aultman*, 37 U. S. Ap., 299, 344, 345.

In this case, the subject is reconsidered as fully as it was in the *Reece* case, and in disposing of it the Court says (pp. 344, 345) :

"Whether he specifically claims in his patent the benefit of equivalents or not, the law allows them to him according to the nature of his patent. If it is a mere improvement on a successful machine, a mere tributary invention, or a device the novelty of which is confined by the past art to the particular form shown, the range of equivalents is narrowly restricted. If it is a pioneer patent with a new result, the range is very wide and is not restricted by the failure of the patentee to describe and claim combinations of equivalents. Nothing will restrict the pioneer patentee's rights in this regard save the use of language in his specification and claims which permits no other reasonable construction than one attributing to the patentee a positive intention to limit the scope of his invention in some particular to the exact form of the device which he shows, and a consequent willingness to abandon to the public any other form, should it be adopted and prove useful. Instances of such a limitation may be found in *Keystone Bridge Company vs. Phoenix Iron Company*, 95 U. S., 274, and in *S. N. Brown & Company vs. Stilwell & Bierce Manufacturing Company*, 6 U. S. App. 427; s. c., on petition for rehearing, 16 U. S. App., 234. But there is no such limitation in the patent under discussion, and the rule applies which was so fully explained in *Winans vs. Denmead*, 15 How., 330, 342, where the Court said: "Patentees sometimes add to their claims an express declaration to the effect that the claim extends to the thing patented, however its form and proportions may be varied. But this is unnecessary. The law so interprets the claim without the addition of these words." Again, in *Goodyear Dental Vulcanite Company vs. Davis*, 102 U. S., 222, 230, the Supreme Court said that a patentee was protected against equivalents whether he claims them or not. A most satisfactory discussion of this general subject may be found in the opinion of the Circuit Court of Appeals of the First Circuit, in *Reece Button Hole Machine Company vs. Globe Button Hole Machine Company*, 21 U. S. App., 244, where Judge PUTNAM, on behalf of that Court, examines the two lines of cases of which *Winans vs. Denmead* and the *Keystone Bridge Company vs. Phoenix Iron Company*, *supra*, are respective types, and reconciles them so far as they may be reconciled."

And the *Reece* ruling herein is being extensively applied in cases at circuit.

*Rhodes vs. Lincoln Co.*, 64 F. R., 218, 220.

*Campbell Printing Press Co. vs. Marden*, 64 F. R., 782, 785, 786.

*New Departure Bell Co. vs. Bevin Co.*, 64 F. R., 859, 864.

*Richardson vs. Am. Pin Co.*, 73 F. R., 476, 478.

*Bonsack Machine Co. vs. Smith*, 70 F. R., 383, 396.

*Westinghouse vs. Boyden Co.*, 66 F. R., 997, 1006.

5. The ruling herein of the Court of Appeals for the Fourth Circuit, especially as applied to pioneer inventions, is strongly in derogation of the rulings of this Court in a large class of cases, of which *Morley Machine Co. vs. Lancaster* (129 U. S., 263) is one. It would, if carried out, completely withdraw the protective influence of the doctrine of mechanical equivalents from the most useful and beneficial inventions which we have, simply on account of a mere technicality of detail, unimportant in itself, and which, so far as it concerns the defendant, is utterly devoid of equity and, as related to the patent, is directly contrary to equity.

6. The identical question here presented, under the same patent and on the same facts, was the subject of judicial inquiry in the Second Circuit nearly two years ago in *Westinghouse Air-Brake Co. vs. New York Air-Brake Co.*, 65 F. R., 99. The case was heard by Judge LACOMBE on a motion for a preliminary injunction, but every fact and argument that could be urged on final hearing was then presented. Judge LACOMBE, in overruling this defense, expressed himself with his usual clearness and cogency (65 Fed. Rep., 101):

"Defendant relies upon the rejection by the patent office of the original first claim of 360,070 and the substitution of the present first claim as an abandonment of the fundamental broad invention therein disclosed. When, however, the reference on which the patent office rejected the original first claim (Boyden's patent No. 280,285) is consulted, it is apparent that the essential change in the claim is the phrase used to differentiate 360,070, an invention to be used 'in the application of the brake,' from Boyden's invention, whose object was to provide for replenishing, 'while the brake is on,' the air reservoir or brake cylinder, when the pressure is reduced by leakage, etc. There is nothing in the file wrapper or contents to show that the patent office required or that the inventor agreed to abandon what was the great feature of his invention—the emergency valve—or to give up whatever range of equivalents his patent might, as modified, fairly cover. Both these patents 360,070 and 376,837 are broad ones, and their claims should be construed to cover the meritorious invention they disclose, unless the language of such claims precludes such a construction. The only question really open on this motion is that of infringement."

Defendants appealed. In the Circuit Court of Appeals, the action of Judge LACOMBE under Patent 360,070 was affirmed, "*Per Curiam*," which action certainly implies no serious dissatisfaction in

the Court of Appeals with the rulings of Judge LACOMBE under that patent.

7. It is submitted that the decision of Judge MORRIS on this point, as briefly expressed in this case at circuit, should be affirmed. Referring to all three of the amendments above summarized, he says (Rec., p. 851) :

"The amendments made to meet the objections of the Patent Examiner are not to be construed to disclaim the patentee's actual invention, if such construction can be avoided without doing violence to the obvious meaning of the language.

"*Lake Shore Railway Co. vs. Car Brake Co.*, 110 U. S., 229-236.

"*Reese Buttonhole Machine Co. vs. Globe Buttonhole Co.*, 61 Fed. Rep., 956."

### **Defendants' "Partition 9" and "Restricted Port B." "Momentary Differential Pressures."**

These considerations have already been incidentally discussed ; but the importance ascribed to them by the defendants, renders a separate and further discussion not inappropriate.

After perusing the proofs in this case, there can be no reasonable doubt as to the correctness of three or four propositions.

1st. That Mr. Boyden, in getting up or designing the defendants' quick-action valve, did so with a full knowledge of the invention here in controversy. In fact, he admits as much (Rec., pp. 514-516, Q. 25).

2d. That in getting up or designing this valve, he studiously sought to embody in it the salient features of the "automatic" brake, and also to combine therewith the direct admission of train-pipe air to the brake cylinder, to effect the "quick-action" operation, when and only when unexpected emergencies in the running of the train should require it.

3d. That he sought to do this by a form or structure of apparatus which should retain every essential element of operation and of function which is to be found in the Westinghouse apparatus,

and retain it so perfectly as, in practical use, to be interchangeable with it, and to operate with it in the same train, to do the same work, in the same way, and under identically the same conditions. And it is so stated in defendants' catalogue (Rec., p. 489, last paragraph but one) :

"The actions of this valve in graduating, full service application, quick action and the release, are the same as the new Westinghouse quick-action valve, thereby producing the same results in breaking, which renders cars equipped with the two valves perfectly interchangeable—the hose couplings being the same."

*4th.* Also, that he sought to design a form or structure of quick-action valve which ocularly, or *to the eye*, should differ from the Westinghouse in as many of its details as possible, but *without loss of any essential function or feature of operation.*

Thus far, we think there can be no dispute. Mr. Boyden, himself, would probably admit this much, if he has not already done so.

Boyden's assumed position, as we understand it, involves two further propositions, in substance as follows :

*5th.* That, in making these changes, he has made a new substantive invention of his own, which in defendants' proofs is referred to as "The Partition 9" and "The Restricted Port B," and which, as alleged, produce, or result in, a novel operation, referred to as "Momentary Differential Pressures."

*6th.* That, in doing this, he has not used any substantial part of the Westinghouse invention.

In reply we say :

(1) A "Restricted Port," by or through which "Momentary Differential Pressures" are alleged to be secured, is found in the Westinghouse Patent 360,070. It is there found in substantially the same combination in which defendants use it, and doing the same work of regulating pressures, and doing it in the same way. Hence Boyden's pretense that this is his invention is not sustained by the facts.

A short explanation will make this clear.

In the emergency use of the brakes, air under pressure enters each brake cylinder from *two sources of supply*, the *auxiliary reser-*

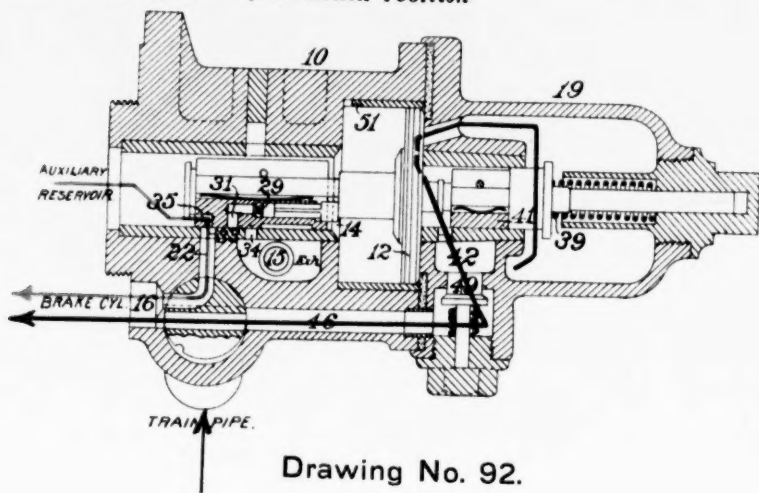
*voir* and the *train pipe*. Just at the instant of the shifting of the triple valve to quick-action position, the *auxiliary reservoir* pressure is the greater, since it is normal, say 70 pounds, while *train pipe* pressure has been reduced by the venting done by the engineer, who has let out 15 or 20 pounds, so bringing it down to 55 or 50 pounds. Now, it is obvious that air at 55 or 50 pounds pressure cannot be charged into the brake cylinder from the *train pipe*, to produce "quick action," if *auxiliary reservoir* pressure at 70 pounds is also admitted at the same time *with equal freedom*. Hence, in order that the *lower* air pressure from the *train pipe* may be vented into the brake cylinder of each car, so as, through a lowering of *train-pipe* pressure on that car, to hasten brake action on the *next* car, it is absolutely necessary that the admission of *auxiliary reservoir* pressure be *choked*, or held back or occur *slowly*, while, for a moment, *train-pipe* pressure flows in *freely*. In other words, in the quick-action use of the brake, some one port between *auxiliary reservoir* and brake cylinder must be smaller in cross-section than the smallest port leading direct from the *train pipe* to the brake cylinder. With the ports so proportioned, *auxiliary reservoir* pressure will be choked or admitted slowly, so that, for a short time, the *lower* pressure from the *train pipe*, entering by the larger port, will pass into the brake cylinder in advance of the *higher* pressure from the *auxiliary reservoir*. In a moment ("momentarily"), the difference ("differential") of pressures, between *train pipe* and brake cylinder, becomes equalized, the check valve closes, and the discharge of air from the *auxiliary reservoir* to the brake cylinder then continues until the maximum braking pressure is reached.

This is what we understand that defendants' experts refer to when they talk about "Momentary Differential Pressures." Possibly they invented this three-worded name, but *the thing itself*—that is, "the restricted port" and *its operation*—is found in the Westinghouse Patent, and in every Westinghouse quick-action triple valve ever made.

To make this clear, we will refer to drawing No. 92, opposite the following page, which is a reproduction of Fig. 2 of the patent in suit (360,970), but with the devices in quick-action position.

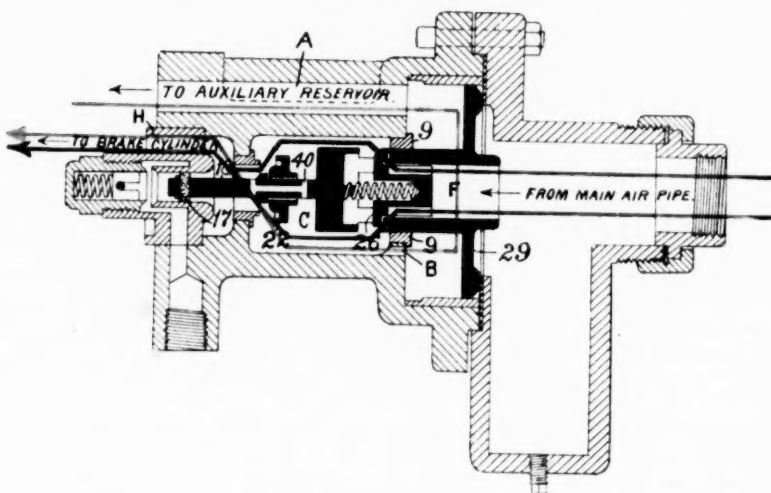


360,070: Quick Action Position



Drawing No. 92.

Defendant's Triple Valve,  
Quick Action Position.



Drawing No. 95.



The blue line indicates the line of direct flow from train pipe to brake cylinder, and the port 42 and passage 46 are the passages of least capacity therein.

The red line indicates the then existing line of flow from auxiliary reservoir to brake cylinder, and the port 35 is the smallest port therein.

Inspection will show to the eye that the feeding ports 31 and 35 are much smaller than either the port 42 or the passage 46. If we measure them, taking the dimensions shown in the patent, we will find that 35 is less than one-ninth the size of either 42 or 46. In other words, port 35, which holds back *auxiliary reservoir* pressure, is less than one-ninth the size of the ports which admit *train-pipe* pressure directly to the brake cylinder.

Furthermore, the patent itself, 360,070, is careful to direct that feeding port be made, as it is made, of "comparatively small diameter." At page 4, line 57, of the patent (Rec. p. 788, top of page), it is specifically directed that—

"The feed opening for the admission of air from the auxiliary reservoir to the brake cylinder, is *purposely made of comparatively small diameter*, it having been determined by experiment that the initial application of the brakes should not be made with maximum force, and *this opening may be made of such size as to apply the brakes exactly in accord with the requirements of the most efficient work.*"

Then, as *train-pipe* pressure flows freely through ports 42 and 46, such pressure soon becomes equalized in the brake cylinder. Then the "momentary differential" condition of things ceases, the check valve 49 closes, and *auxiliary reservoir* pressure continues to flow in normally.

Defendants have not only appropriated the Westinghouse quick-action invention, as a whole, but they have also copied this specific feature of the Westinghouse quick-action valve, with no change whatever, except *in the location* of the small or restricted port. Drawing No. 95, on the opposite sheet (taken from defendant's own "illustrative cuts," No. 8, Rec., facing p. 498), shows defendant's valve. The restricted port B, in the partition 9, corresponds, in all essential respects, to the Westinghouse restricted feeding port 35. It

is, in the quick-action operation, located in the line of flow of pressure from the auxiliary reservoir to the brake cylinder, as illustrated by the red line, just as is the Westinghouse port 35. It is much smaller in size than is defendants' emergency valve port 22, just as Westinghouse port 35 is smaller than his port 42. Defendants may have a slightly greater difference in the relative sizes of the two ports, but this is only a matter of degree. The difference itself is material and substantial in both cases; it is utilized in both to do the same work, at the same times, and in the same way.

These facts, as we submit, effectually disprove Boyden's pretense that this is his invention. It is not. It is found in the patent in suit. He may have invented the particular form of partition 9, but the Court will observe that the partition 9 has no utility whatever, except as it contains the restricted port B, which simply provides for holding back auxiliary reservoir pressure, and thereby secures what Boyden calls "Momentary Differential Pressures." But the restricted port was not his invention, nor was he the first to employ "Momentary Differential Pressures," in operating quick-action brakes. Westinghouse preceded him in both.

Complainants' proofs in support of the above are full and complete.

*Newbury, Rec.*, p. 163, fol. 247, Q. 205.

Complainants' expert, Barnes, also sums up his views in the following brief sentence (*Rec.*, p. 373):

"The restricted passage 35, of complainants' valve, and the restricted passage e, of defendants' 1889 valve, and B, of defendants' 1891 valve, are identical in purpose and function."

Mr. Barnes' reasons for so testifying are given at length at *Record*, pages 372, 373.

Also, in confirmation of the correctness of his conclusions, Mr. Barnes subjected them to actual test.

*Barnes, Rec.*, p. 386, fol. 599 (*d*).

As to the partition 9 of defendants' valve, Mr. Newbury states accurately and fully its relationship to the other operative parts of the mechanism.

*Newbury, Rec.*, pp. 158-160, Qs. 200-202.

Mr. Newbury's cross-examination herein is lengthy and extensive (Rec., pp. 206-235, x-Qs. 236-288).

And that "momentary differential pressures" have actually been used in the Westinghouse valve for many years, and, in fact, that they were employed in the automatic triples, see H. H. Westinghouse (Rec., p. 287, Q. 417), where, in replying to defendants' expert, Arch, he says:

"It is evident that Mr. Church's lack of practical experience has misled him to fail to observe that the principle of momentary differential pressures is not new, and that it is not embodied for the first time in defendants' structures.

"All practically operative triple valves, whether of the kind used prior to 1887 or those subsequently devised, perform their functions properly when momentary differential pressures are created by the means of restricted passages.

"The presence of restricted passages, for the purpose of creating momentary differential pressures, is required for the same purpose in the defendants' structures as in that shown in Patent 360,000, and it does not exist in any different degree in any of these structures."

We submit with the utmost confidence that these proofs fully refute Mr. Boyden's contention that he is the inventor of that which defendants contend is the distinctive feature of their valve, and also show that these features of "momentary differential pressures" required by "a restricted port B" should be credited to Westinghouse, along with the other essential features of novelty and utility which are admitted and everywhere adjudicated to be his.

And, this being so, Boyden's merits as an inventor drop out of the case. All he has done is to take the essential elements of the Westinghouse quick-action invention, embody them in somewhat different but equivalent forms and relationships, but retaining every substantial feature or element of construction, function and operation.

### **Removing Partition 9.**

Great stress is laid by defendants on what happens, upon the removal of the partition 9. When there is no partition, there is only a *single, unobstructed and large* passage for the flow

of auxiliary reservoir air into the passageway, which *should* conduct train-pipe air to the brake cylinder, in order to cause "quick action." But, under *that* condition of things (as Westinghouse had already shown), there can be *no* "quick action," as train-pipe air cannot flow into a passageway already filled with air at a higher pressure. The two passages may, at some place, join, but must be *so far* separated that the flow of auxiliary reservoir air shall not prevent the flow of train-pipe air, when "quick action" is required. Partition 9, with its restricted port B, accomplishes this. The principal thing which happens, in removing partition 9, is that the removal of the partition necessarily involves the removal of the restricted port B. The partition 9 is of no importance in the case, nor in the device, except as it contains the restricted port B. And this restricted port, as one of the incidents of quick action, has been taken and appropriated by defendants, along with the main invention. As we have clearly shown, they were seriously in error in claiming that it belongs to them.

### **Boyden's 1883 Patent, No. 280,285.**

As this patent figures more or less in the testimony, it should perhaps have a few words of comment.

*1st.* It is not pretended that it contains, either in form or in substance, the quick-action invention here in controversy. Boyden, himself, says of it (Rec., p. 497, Q. 8):

"I wish to state here that my 1883 patent was not for a 'quick-action' valve (as that term is now understood)."

Again (Rec., p. 574, x-Q. 195), he admits the following to be correct, *italics* and all.

"In the triple valve of patent 280,285, *no application whatever* of the brakes is effected by the passage of main air-pipe air to the brake cylinder, and no main air-pipe air is admitted to the brake cylinder until *after* the brakes have been applied with the maximum rapidity and force within the capacity of the device *by auxiliary reservoir air alone.*"

And again in the same answer he says :

" I did not wish to imply, nor do I now, that my 1883 patent is for a quick-action valve such as you have stated."

And the patent itself is in accord with these admissions. Thus the specification sets forth (Rec., p. 776), as the first and main object of the invention (the italics being our own) :

" *To provide for replenishing, while the brake is on, the air reservoir on each car or the brake cylinder, when the pressure therein has been lessened by leakage.*"

Judge MORRIS' decision followed the lines thus indicated, with the result of finding (Rec., p. 849), that, as between the Boyden patent of 1883 and the Westinghouse Patent No. 360,070, "*there seems to be no analogy or comparison which can be made between them.*" Hence, this Boyden Patent of 1883 was ruled out, as of no effect in the case.

No exception was taken to this ruling, and the Court of Appeals did not even refer to this patent.

Hence, we presume that it may be disregarded, except as to three facts.

#### FIRST: THE DISCLAIMER.

In order to draw clearly the distinction between what was old and what was new, Westinghouse was required to disclaim in his specification this Boyden 1883 device. He did so. It is then argued that this disclaimer operates as a limitation, not as to something which, being old, he *could not* claim, but as to something which, *being his*, he *has claimed*.

*Non sequitur.* He merely disclaimed a device or mechanism which was prior in date, but which had no substantial identity with the invention of his. He disclaimed, not a part of his invention, but *something else*. Boyden says three times, under oath, that it is *something else*. The patent itself says that it is *something else*. Judge MORRIS says, judicially, that it is *something else*. Defendants, by not excepting, practically admit that it is *something else*. Hence, in disclaiming it was a nugatory act, which did no good and no hurt.

If A and B are different things, the owner of B does not, by disclaiming A, limit at all his right to B, and to everything that appertains to B.

## SECOND : THE CHECK-VALVE DEFENSE.

Mr. Boyden, when on the stand, also tried to make it appear that he was the first to put a check valve in the passageway or port leading from a train pipe to a triple-valve chamber—that is, his check valve 26; that such a check valve was contained in his patent of 1883, No. 280,285, and was transferred to defendant's present valve (Rec., p. 497, Q. 8).

The evident purpose of this was to acquire some credit to himself as an independent inventor.

We prove, in reply, that he did not invent this any more than he invented the restricted port. It is found in two U. S. Patents of 1875, and in an English Patent of 1879—long prior to Boyden's 1883 Patent.

*Newbury*, Rec., p. 160, Q. 203.

## THIRD : ANOTHER ALLEGED BOYDEN INVENTION.

Mr. Boyden also tries, in the same connection, to get some credit out of the alleged fact that he showed in his old 1883 patent "a single valve H arranged to govern a port through which the air pressure from the main air pipe and the air pressure from the auxiliary reservoir both pass to the brake cylinder" (Rec., p. 497, Q. 8).

As we have already seen, he did this in his 1883 patent merely *to replenish loss by leakage; not to apply the brakes*. That was already done, and done just as in the old automatic brake. Through the *same passages and ports* which were used in applying the brakes, Boyden proposed to replenish loss by leakage.

As Boyden has three times admitted that this did not involve quick action, we need not discuss *that* question further. But as to the "*something else*" which he says, or at least implies, was his, we show that it, too, was older in the art than 1883. It is found in English Patent No. 3000 of 1879 (Rec., p. 163, fol. 246).

It is hence submitted :

1st. That as an inventor of any *substantive matter of invention*, whereby the Boyden valve is, *as to its essential elements*, differentiated from the Westinghouse, Mr. Boyden has no standing whatever. That feature on which he bases his chiefest claim, "the Restricted Port B" in "the Partition 9," whereby to secure "Momentarily Differential Pressures," all this was taken bodily from Westinghouse.

2d. That as regards any claim of credit to himself on account of any substantial addition made by himself to the art prior to 360,070, Mr. Boyden has just as little standing as before. Hence :

3d. That as regards defendants' present infringing valve, Boyden is not entitled to rank any higher than that of a subsequent improver, in mere details, of a pioneer invention of unimpeachable novelty and immeasurable utility.

### **"Substantially as Described."**

In our assignments of error filed with our petition for a writ of certiorari, we submitted the following :

"FOURTH. And as matter of error and variance herein, your petitioners respectfully represent that the force and meaning of the phrase 'substantially as set forth,' as explained and applied by the said Circuit Court of Appeals for the Fourth Circuit, is directly at variance with the decisions of this Court, and is in error as matter of law."

The Court of Appeals, in the opinion rendered by Judge HUGHES, defined what is meant by "substantially as described" (Rec., p. 877, last two lines, and top of p. 878).

This Court, in *Lake Shore Co. vs. National Co.*, 110 U. S., 229, 235, defined the meaning of this and other like phrases, and the definition then given is, as we understand, generally recognized by the profession as still authoritative and binding. It runs thus—the italics being our own :

"the words 'substantially as specified' mean substantially as specified *in regard to the combination* which is the subject of the claim."

Nor was this an *obiter dictum*. The issue of infringement turned upon the meaning and force of these words.

This decision was cited in the Court of Appeals in the argument of this same issue in the case at bar. That Court disregarded the rule or definition thus cited, and held, as we understand their decision, that "substantially as described" relates not to *the combination* which is the subject of the claim, but to the *separate or individual elements* which make up the combination.

And this variance is material and important in that the decision as thus made by the Court of Appeals, as a Court of last resort, may be regarded as final and authoritative in the Circuit Court of that and possibly other Circuits.

It is believed that the error thus made should be corrected by an affirmance of the rule formulated in *Lake Shore & M. S. Co. vs. National Co.*, *supra*, or in such other manner as may seem good to the Court.

### **The Westinghouse Patent 217,838.**

A copy of this patent will be found at record, page 759.

It is not claimed anywhere in the proofs, or elsewhere, so far as we know, that this patent contains or anticipates the invention here in suit.

Judge MORRIS says of it (Rec., p. 847):

"It is true that, in searching for some device which would give quick action, Westinghouse had, before the date of the patent in suit, conceived the idea that it might be accomplished by venting the train pipe at intervals along the train. He had tried having two or three vents at intervals in the length of the train controlled by electrical apparatus, and also had tried relief valves placed in the pipe coupling of each car which would open to the atmosphere and vent the train pipe quickly in case of accident or other sudden release of pressure in the forward part of the train. This was shown in the Westinghouse Patent No. 217,838, July 22, 1879, but neither of these attempts were successfully applied, and *they did not solve the problem of quick action.*

"*The problem was not solved; indeed, the first step in the direction of solving it does not appear to have been taken until the experiments which led to the Westinghouse patent now in suit.*"

As defendants took no exception to this ruling of Judge MORRIS, it may be inferred that they are satisfied with its correctness.



The principal effect of this Patent 217,838 is in that it tends to show that as early as 1879 Mr. Westinghouse *tried* to make a quick-action brake, but at that time he did not know how.

The result was that he made a mechanism which was inoperative and worthless for any practical use, except as it told all subsequent inventors that *that way had been tried and had failed* (Newbury, Rec. p. 189, Q. 223; Barnes, p. 405, Q. 699).

Really, this issue of inoperativeness was of doubtful relevancy, under the pleadings. As already stated, this device of patent 217,838, did not contain the invention in question, and nobody had said that it did; but as defendants' experts had tried to give it some prominence as a part of the state of the art, we considered it a sufficient reply to prove its inoperativeness.

Defendants, by special leave of Court, undertook to reproduce the apparatus of this patent, and by testing it to show that it would work. Mr. Boyden testified as to these tests, and finally, on cross-examination, he admitted that:

"The results produced by the devices of patent 217,838, *as I tried them*, are not of an efficiency that would justify me in recommending the use of the devices to railroad officials." (Rec. p. 692, X Q. 346).

In the next following answer, speaking of the same apparatus, he says that it "was not practically operative to be used in service."

And when pressed for his opinion, in the question next following, he says:

"My opinion is that the device *as I used it* would not be acceptable to railroad officials for practical use."

While it is hardly necessary to reply to such testimony as this, we proceeded, perhaps out of excess of caution, to prove, in reply, (1) that Boyden, in his efforts to make the apparatus work, had departed from the instructions of the patent; (2) that he had done this without any warrant whatever; (3) that the change or departure which he had made, destroyed the *intended* operation of the device—that is, that the apparatus as he changed it, would *not* operate in the manner described in the patent, and (4) that what

little success he did attain in making his apparatus work, was due to the *unauthorized change* which he made in its structure.

This, as well as Boyden's admissions, quoted above, amply confirm what we said at first—that it is an inoperative mechanism.

The replying testimony of Westinghouse is not lengthy, and fully sustains the four points last above stated (Rec., p. 829 *et seq.*).

### **Sundry Theories of Defendants' Experts.**

It would unduly lengthen the present brief, were we to follow in detail *all* the erroneous or misleading distinctions which defendants' experts elaborate at greater or less length. Nor is it thought to be necessary, in view of what is believed to be the controlling character of the considerations already presented. But we may properly note them, lest it be thought that we have no reply.

1. Effort is made, through page after page, to distinguish the Boyden quick-action valve 22 from the Westinghouse quick-action valve 41, for the reason that the latter valve is a "*separate*" valve from the valve 14, which primarily governs the flow of *auxiliary reservoir* air to the brake cylinder.

This is wholly a fallacious distinction. The Boyden valve 22 is a "*separate*" valve from the Boyden stem slide valve *i, k, j*.

The feature of "*separateness*" of construction and operation, is mechanically and functionally as fully present in one as in the other.

2. It is also said that the Westinghouse quick-action valve 41 is an "*added*" valve—that is to say, that it was added to the triple mechanism of 220,556, in the making of the invention in suit.

This is at least an effort at a *misleading* distinction.

Defendants allege that their quick-action valve 22 is a modification of another old Westinghouse triple valve—that of Patent No. 141,685—a modification of the plug valve *o*. We have already, with some fullness, discussed this theory of theirs, but a word or two more may be in place.

Assuming that what they say in this respect is true—that they

*did* modify 141,685, and that they modified it along the lines which they now point out, *how did they do it?*

We contend that they are in error in their understanding of the modifications which they say that they made, and we have endeavored *supra* to show the facts in their true aspect. But we will now assume—but only for the sake of argument—that the Boyden valve 22 is a modification of the plug valve *o* of 141,685.

How, upon that assumption, was it modified?

It will be seen that the plug valve *o* of 141,685 is rigidly connected by an intermediate stem with the diaphragm which moves it. Boyden, in making his alleged modifications, after changing its form from a “*plug*” to a “*poppet*” valve, *detached it from its stem*, so that it was no longer rigidly connected thereto as before, but could remain in place during the “*preliminary traverse*” of the piston and stem.

This loosening of the valve from the immediate control of its stem *made another valve of it*. It acquired by such change and modification a new capacity and function. It was no longer the same valve either in structure or in operation. In both respects it was materially altered. It was a “*main*” valve *before* the change; it was a “*quick-action*” valve *after* the change.

The change being made, Boyden had next to provide a “*main valve*.” Hence, the stem hole *i, j, k* was bored and the sliding stem became the main valve.

Hence, defendants’ contention amounts simply to this:

Westinghouse had a “*main*” valve, which, algebraically, we will call *a*, and which in its perfected form (220,556) answered his purpose.

He invented and, as defendants contend, “*added*” thereto a “*quick-action*” valve, which, algebraically, we will call *x*, as it was previously unknown.

Boyden took an older form of the known “*main*” valve *a* (141,685), modified and changed it till he had put into it the essential features of novelty and utility which belonged to the new quick-action valve *x*, and then “*added*” another “*main*” valve *a* in lieu of the “*main*” valve which he lost by making the change.

Both triple valves contain  $a+x$ , as the final result of the working out of the equation. Hence there is no substantial difference due to the way in which either was produced.

3. The analysis of "valve functions," which is made at great length by Boyden and Church in the first part of the testimony of each, in connection with the conclusions which they seek to draw therefrom, is fallacious and misleading, and is so, chiefly because:

It is based on an error of observation and of fact in the working of valve 22. Boyden and Church both failed to note or observe the fact that valve 22 never opened in ordinary *service* use, until *after* the *air-charging* work of ordinary service was substantially completed. The facts herein (Barnes, Rec. p. 391) have already been discussed (*supra*, p. 42 *et seq.*). Hence, it will be seen that Boyden and Church fell into the error of attributing to the Boyden valve 22 a "main-valve" function which the facts clearly show that it does not possess. (Newbury, Rec. p. 168, Q. 210.)

If the Court desires to go into this matter further, the facts bearing thereon are presented in the record without undue prolixity. (Newbury, Rec. p. 176, Q. 217; Barnes, Rec. pp. 355-358, Q. 660-662.)

4. Defendants refer with much apparent emphasis, to the passage 46, which Mr. Westinghouse made in the walls of his valve case, as a port for the direct flow of air, in the quick-action operation, from the train pipe to the brake cylinder. In the Boyden device, this line of flow is through an enlarged port or passageway F, made for the purpose, in the triple-valve piston 29. Effort is made to find herein a material difference.

We have already discussed this question at probably sufficient length, when considering the issue of infringement. We refer to it again only to say that an air port through the centre of the triple-valve piston, is found in the Westinghouse triple-valve patent, No. 172,064, where it is designated by the letter *s* (Rec., p. 757).

Hence in changing the direct passage way in question from the walls of the casing to the centre of the piston, defendants have not merely taken an *old and well-known substitute*, but they have taken

substitute which *Westinghouse* invented. And then, they pretend that it is theirs, and not his.

5. Because *emergencies* always existed in the running of railway trains, and because the application of brakes, in *emergencies*, has long been well-known, therefore, defendants argue that an *emergency brake* was not a new thing in the art, at the date of the invention here in question.

This involves merely an effort, by applying an *old* name to a *new* thing, to suggest that the *new* thing is *not* new.

Old brakes were applied in emergencies, but there was no brake known in the art as an *emergency brake*, until the introduction of the Westinghouse Quick Action or Emergency Brake. Emergencies in the running of trains were known; emergency applications of old brakes were also known; but an *emergency brake* was *not* known. *That thing* was first invented and patented by Mr. Westinghouse, in and by the letters patent here in suit.

It is submitted that the case should be remanded, with directions that a decree be entered for complainants.

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GEORGE H. CHRISTY,

For Westinghouse.

GEORGE H. CHRISTY,

Solicitor.

FREDERIC H. BETTS,

J. SNOWDEN BELL,

BERNARD CARTER & SONS,

Of Counsel.



203 & 204

To Chief of Christy, Denny & Bell

United States Circuit Court:  
*Westinghouse & Co.*  
SOUTHERN DISTRICT OF NEW YORK.

*Filed Oct. 22, 1896.*

THE WESTINGHOUSE AIR BRAKE  
COMPANY,

*Complainant,*

215.

THE NEW YORK AIR BRAKE COMPANY,  
ISAAC B. NEWCOMBE, ROYAL C. VILAS,  
CHARLES A. STARBUCK and JOHN C.  
THOMPSON, Directors,

*Defendants.*

99  
IN EQUITY.

No. 5969.

116

Decision of Judge Lacombe, Sustaining the Westing-  
house Quick-Action Patent No. 360,070, and  
Granting Injunctions under It and under  
Patent No. 376,837.

KERR & CURTIS,

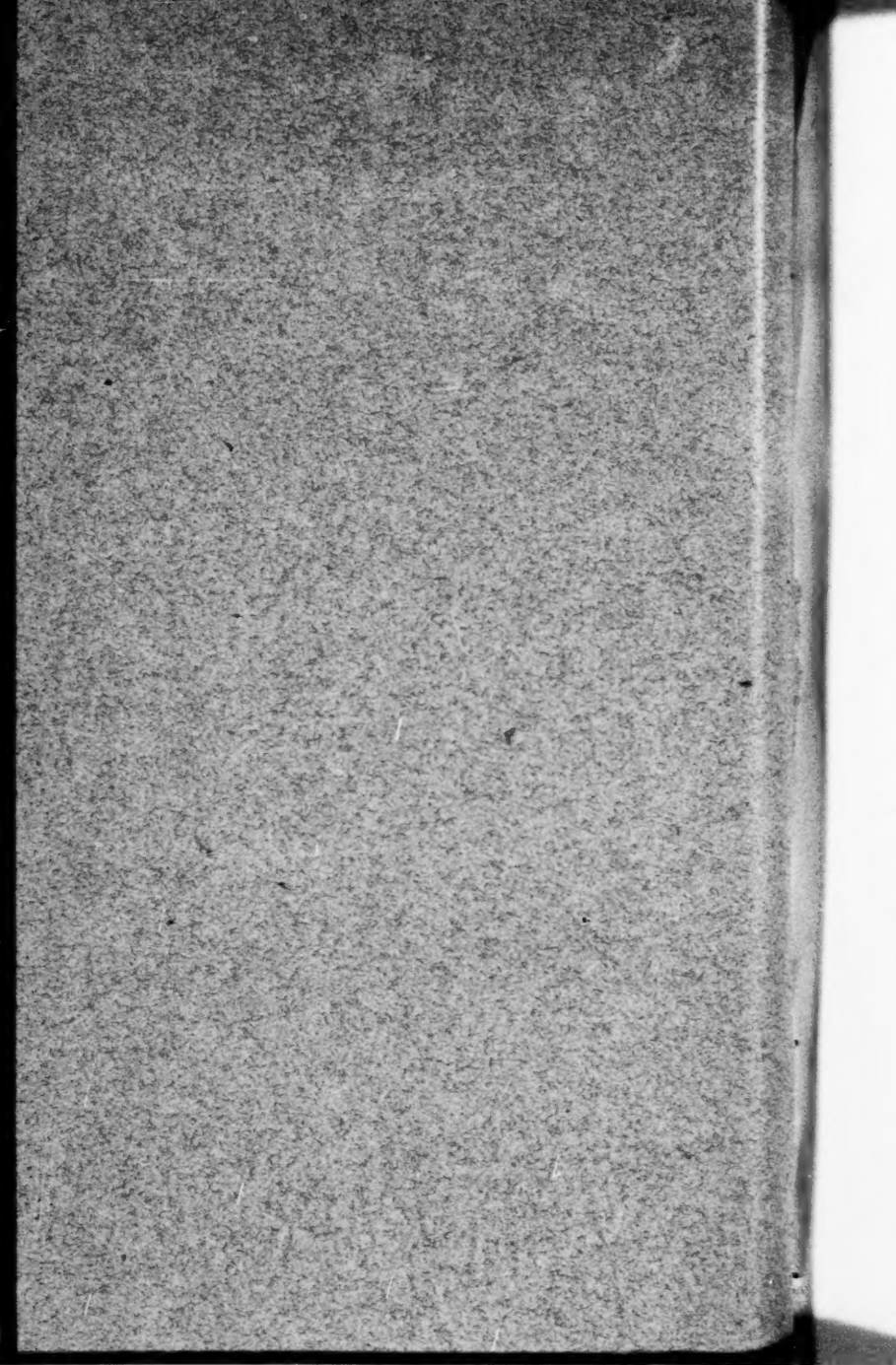
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# United States Circuit Court.

SOUTHERN DISTRICT OF NEW YORK.

THE WESTINGHOUSE AIR-BRAKE  
COMPANY,

vs.

In Equity,  
No. 5969.

THE NEW YORK AIR-BRAKE COM-  
PANY, ET AL.

This case, which comes up for hearing upon pleadings and proofs, is a suit in equity to enjoin infringement of certain Letters Patent of the United States. These patents are three in number, viz.: No. 360,070, to George Westinghouse, Jr., March 29, 1887, for "Fluid-Pressure Automatic-Brake Mechanism," complainant alleging infringement of claims 1 to 5 inclusive; No. 376,837, to George Westinghouse, Jr., January 24, 1888, for "Fluid-Pressure Automatic-Brake Mechanism," complainant alleging infringement of claims 1, 3 and 4, and No. 393,784, to Harvey S. Park, December 4, 1888, complainant alleging infringement of claims 1, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15 and 16.

LACOMBE, Circuit Judge :

Judicial opinion, as to the validity and construction of these three patents, has been so fully expressed in the various decisions already rendered, and which are referred to below, that no extended disquisition is either necessary or proper in this Court. Reference may be had to the opinions cited, for a statement of the reasons

which have induced the conclusions hereinafter briefly indicated.

Suit was brought in this Court upon 376,837 and the Park Patent, and came on for hearing before Judge TOWNSEND, who sustained the validity of both patents, found infringement of 376,837, and non-infringement of the Park Patent (*Westinghouse vs. New York Air-Brake Co.*, 59 Fed. Rep., 581, Nov. 20, 1893). This suit was appealed to the Circuit Court of Appeals in the Second Circuit, and Judge TOWNSEND's decision as to these two patents was affirmed (*Westinghouse vs. New York Air-Brake Co.*, 63 Fed. Rep., 962, Oct. 15, 1894). Defendants modified their device, and the suit at bar was brought to enjoin the sale or use of their new "Quick-Action Triple Valve B." Application was made, upon elaborate affidavits, for a preliminary injunction, the motion was argued at great length, was duly considered by this Court, and an opinion filed December 24, 1894, sustaining the validity of No. 360,070 (which has not been in issue in the earlier suit), and finding infringement of claims 1, 2 and 4 of that patent, and also of claim 1, of 376,837 (*Westinghouse vs. New York Air-Brake Co.*, 65 Fed. Rep., 99). Suit was also brought in the Circuit Court for the District of Maryland, on No. 360,070, to enjoin still a different form of mechanism, and the cause coming on before Judge MORRIS, March 11, 1895, he held claims 1, 2 and 4 to be valid, and found infringement of claim 2, but not of claims 1 or 4 (*Westinghouse vs. Boyden Power-Brake Co.*, 66 Fed. Rep., 997). An appeal from the preliminary injunction, issued in the suit at bar, came up for hearing before the Circuit Court of Appeals in the Second Circuit, and was decided May 28, 1895. The decision sustained the Circuit Court, as to Patent 360,070, but reversed as to 376,837, on the sole ground that the question was "too doubtful to be resolved in favor of the complainant upon a motion for a preliminary injunction, and should be reserved for disposition upon the final hearing of the cause" (*Westinghouse vs. New York Air Brake Co.*, 69 Fed. Rep., 715). An appeal

from Judge MORRIS' decision was subsequently decided by the Circuit Court of Appeals, Fourth Circuit, November 11, 1895. That Court sustained him as to claims 1 and 4 of 360,070, but reversed as to claim 2, holding that it is fatally defective in claiming only a result, and not identifying the specific means by which that result is achieved (*Westinghouse vs. Boyden Power-Brake Co.*, 70 Fed. Rep., 816).

In the light of these decisions, the questions now presented are to be disposed of.

#### PATENT No. 360,070.

Claims 1, 2 and 4 were sustained by this Court, on motion for preliminary injunction, and infringement found. The Court of Appeals in this Circuit has sustained that decision, in these words: "We agree with the Court below that the defendants' apparatus is an infringement of the first, second and fourth claims of Patent No. 360,070, and deem it unnecessary to add anything to the opinion." In the record now presented at final hearing, there is nothing which calls for any modification of the opinion already expressed. To enter into any extended discussion of the case, as to this patent, would be a work of supererogation, inasmuch as the case in the Fourth Circuit, above cited, has been taken by *certiorari* to the Supreme Court, and, because of the existing difference of opinion between the Courts of Appeal in the two Circuits, has been advanced on the calendar so that it will be submitted to that tribunal, for final disposition, within the current month. The fifth claim of this patent was not passed upon, on the motion. It differs from the fourth, only in adding a check valve to the combination of that claim; it is not disputed that defendants' device contains a check valve, and, if it be held to infringe the fourth claim, it infringes the fifth as well. The third claim contains, as an element, "a second admission of air from the auxiliary reservoir to the brake cylinder." Manifestly, this is a narrower claim than those discussed when the case was here before, and, since the patentee has chosen to make a

"second admission of air" material, infringement is not found in a device which substitutes a "single admission of air," although such *single* admission be continuous.

PATENT No. 376,837.

In reversing the former finding of this Court, as to the first claim of this patent, the Court of Appeals did not pass upon the merits. It held only that the question was too doubtful to be resolved, upon motion for a preliminary injunction, but should be reserved for final hearing, upon a complete record, where abundant opportunity has been given to reply to testimony, expert or other, and to cross-examine all witnesses. An examination of the record, as it now stands, has not changed the conclusions of this Court, as heretofore expressed, and it is therefore unnecessary to do more than refer to the former opinion, as stating the reasons for holding the first claim to be infringed.

The third and fourth claims have not been passed upon by this Court, and were not presented to the Court of Appeals. Both of them contain, as an element of the combination, "a passage establishing communication between said supplemental piston and an auxiliary reservoir." The complainants contend that this passage is to be found in defendants' port "*p*." Inasmuch as this Court finds "an auxiliary reservoir" in the space which is contained in the chamber *P* above the piston, and in the port or passage *p*, below the cut-off 14 in the sliding valve, it is manifest that there is no "passage establishing communication" between the supplemental piston and such "reservoir." If this Court is right in holding that the space referred to is "an auxiliary reservoir," then it abuts directly on the supplemental piston, and any "passage" between the two is dispensed with. For this reason it is thought that the third and fourth claims of No. 376,837 are not infringed.

## PARK PATENT No. 393,784.

The Court of Appeals in this Circuit has held that this is a subordinate patent, and must receive a narrow construction. The feature which Park introduced into the quick-action operation, was the working of the emergency valve piston by *train-pipe pressure*. This specification states that the object of the invention is "to enable a better, quicker and more certain action to be had of pneumatic controlling devices for air brakes, \* \* \* and, *at the same time*, have the valve, controlling the direct passage of the pressure from the train-pipe to the brake-cylinder, *under the direct action of the train pipe pressure*." In describing the operation of his device, the patentee says: "the train-pipe pressure through the pipe Z will act on the under side of the valve S, opening the valve: &c."; and, also, "It will be thus seen that the valve S is controlled on both opening and closing by the train-pipe pressure, \* \* \* and, with this construction, the train-pipe pressure performs the office of both opening and closing the valve." Many of the claims contain words describing the valve, or the valve and passages, as "actuated by train-pipe pressure," or "controlling the pressure to the brake cylinder direct by train-pipe pressure," or some equivalent phrase. Other claims there are, which contain no such phrase; but, since Park's invention was a device for working the emergency valve piston by train-pipe pressure, the complainant's expert is entirely correct in the statement, that "all (the claims) refer to combinations of parts, which relate to the various structural features of a triple valve, in which the extra traverse of the pistons so adjusts the parts, that the valve between the train pipe and the brake-cylinder can be *opened by the compressed air in the said train pipe*. \* \* \* The improvement that Park introduced in the art, and has described in his patent, only threw upon the main piston the extra labor of compressing the spring H; the valve S, being a poppet valve, did not have to be slidden over its seat, while under pressure, by the movement of the

piston, but *was raised by the air pressure in the train pipe*. This is thought to be an improvement \* \* \* minor improvement of the Westinghouse Patent. \* \* \* Thus, it will be seen that all the claims of the Park Patent relate to that improvement."

The conclusions expressed in the former opinion of this Court, when granting the preliminary injunction, and which are still adhered to, as to the relations between the defendants' valve and the first claim of Patent 376,837, dispose of the contention that such valve infringes the Park Patent. All compressed air, in any part of the entire brake system behind the engine, is, or has been, train-pipe air. It is compressed in the main reservoir on the locomotive and, thence, passes into the train pipe proper, and from that train pipe into its several branches and such chambers, connected therewith, as may admit of its entry. All agree that, while it is still in the train pipe, the force it exerts is "train-pipe pressure." All agree that when train-pipe air has passed through the charging port into the auxiliary reservoir of the original triple-valve device, or its subsequent modifications, the force it exerts is "auxiliary reservoir pressure." This Court has found, further, on complainant's contention, and against defendants' opposition, that, when train-pipe air has passed through some other port or passage into another chamber, and has been confined therein, and cut off from further connection with the source of supply, the force which it exerts is "pressure from an auxiliary reservoir," and, because of such finding, has held defendants' valve to be an infringement of Patent 376,837. If this finding be correct, defendants' valve does not infringe the Park Patent, because, in that patent, the compressed air, whose expansive force lifts the piston, is within a chamber in free communication with the train pipe; it has not yet passed beyond any barrier which segregates it from the whole body of train-pipe air, and its force may fairly be called train-pipe pressure; while, in the defendants' valve, the compressed air, by the dissipation of whose expansive force the piston is induced to move, is within a cham-

ber which has been absolutely cut off (by the slide 14) from the train pipe; it has been segregated from the general body of train-pipe air, into an independent reservoir, and its force may fairly be called "pressure from an auxiliary reservoir." For these reasons, it is thought that defendants' "Quick-Action Triple Valve B," the device complained of, does not infringe the Park Patent.

A decree will be entered, in accordance with the views above expressed.

October 13, 1896.

E. H. L.

A Copy.

JOHN A. SHIELDS,

(SEAL.)

Clerk.

# Supreme Court of the United States.

OCTOBER TERM, 1896.

No. 403.

BOYDEN POWER BRAKE COMPANY, ET AL.,  
APPELLANTS,  
VS.

GEORGE WESTINGHOUSE, JR., and THE WESTING-  
HOUSE AIR-BRAKE COMPANY.

No. 426.

GEORGE WESTINGHOUSE, JR., and THE WESTING-  
HOUSE AIR-BRAKE COMPANY,  
APPELLANTS,  
VS.

BOYDEN POWER BRAKE COMPANY, ET AL.

## **SUPPLEMENTAL BRIEF FOR WESTING- HOUSE AND WESTINGHOUSE COM- PANY.**

A re-argument of the above appeals having been ordered by this Court, it seems proper that a few supplemental suggestions should be adverted to, which were called to our attention by the former argument.

These will be briefly dealt with, under separate headings.



## I.

**Importance of the invention before the Court.**

Whatever may be asserted (erroneously as we hope to show), as to the defectiveness *in form* of any claim in the patent in suit, it is impossible to deny the commanding importance of the invention which underlies the patent, and which it purports to describe and claim.

The briefs and arguments of the Boyden counsel emphasize this fact.

Less than ten years ago, air or power brakes could not be utilized for the quick stoppage of long freight trains, and, as freight trains were almost invariably long, such brakes could not be so used on freight trains at all.

The highest type of power brake which existed prior to 1886 was radically defective.

Mr. Hill states this, and the reason for it, with great clearness and precision, in his brief (p. 12) :

“ TRIPLE VALVE DEFECTIVE ON LONG TRAINS.”

“ The triple valve, thus slowly evolved from the original form of Patent No. 141,685, August 12, 1873, to the highly improved form of Patent No. 220,556, October 14, 1879, and in the latter form used by the complainants without further material improvement till the year 1888, was satisfactory for short trains consisting of eight or ten cars or less, but on long trains consisting of forty or fifty cars or more, it was not only unsatisfactory, but absolutely impracticable ; *and its impracticability resulted from the very fact that the piston had the two traverses* referred to by Mr. H. H. Westinghouse at the bottom of p. 123, namely, a partial traverse for graduating purposes, and a full traverse for emergency stops”. (Italics are Mr. Hill's.)

Mr. Westinghouse, by the remarkable invention in suit, converted the very cause of difficulty into an element of success.

While a triple valve, with a piston having the capacity for “ two traverses,” was, *by reason of that very fact*, incapable of use

in emergencies on long trains, *because*, having a piston with a double traverse, it admitted air only from an auxiliary reservoir, Mr. Westinghouse, by using the second or "further traverse" to admit "*train-pipe*" air, caused the very defect of the prior structure to be a means of reaching the *new result*.

Such triumphs in mechanics are only achieved by those whose genius is of that supreme quality which enables a commander to snatch victory from defeat.

Speaking of the *second* claim,\* Judge MORRIS said (R., p. 848):

"The *gist* of that invention is the use of the further traverse of the triple-valve piston to open a *valve which admits air directly from the train pipe to the brake cylinder, with the result that the train pipe is vented, and the train-pipe air utilized.*"

It is a conceded fact that no prior mechanism comprised these features, or ever accomplished this result, *in any way whatsoever*.

By the invention in suit, air brakes on freight trains first became a possibility, and have now become a necessity of national importance.

Three times, since the announcement of Mr. Westinghouse's achievement, the President of the United States, in his annual message to Congress, has called for the enactment of laws requiring railroads engaged in interstate commerce to equip themselves with such brakes (and with automatic couplers), "in order to greatly reduce the present fearful death rate among railroad employees" (President's Message of 1890).

Prior to Mr. Westinghouse's invention, it is conceded that no device existed which could have been made the basis of such legislation.

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\*As shown in our prior brief (pp. 29, 30), the first and fourth claims are shown to not require a double traverse of a *single* piston, but to be based upon another feature, viz., that there shall be *two valves*, one ("the main valve") to admit air from the reservoir for service work, and the other, an "auxiliary" valve, to admit train-pipe air for emergency work.

Congress has now made the use of such brakes, on Interstate roads, imperative (Act of 1893, Ch. 196), and many of the States have legislated to the same effect, as to railroads within their limits (Rec., p. 135, see p. 202). Mr. Westinghouse, speaking in 1891, said (Rec., p. 132) :

" Previous to the Burlington Trials, the subject of legislation having in view the compulsory use of power brakes upon freight trains, on account of humanitarian considerations, was seriously considered, *but the absence of practical devices rendered legislation on this subject impossible.*

" Since the introduction of the *quick-action brake*, several of the State legislatures have enacted laws making the use of power brakes on freight trains compulsory ; and the National Legislature has had the subject before them for consideration." (Italics ours.)

The "Quick Action" brake has also demonstrated its greater efficiency, even on passenger trains, and is rapidly superseding older forms. Passenger trains, by its aid, can be stopped " in a distance from 25 % to 40 % less with the quick " action brakes than when the prior automatic system was " used " (Rec., p. 132-3).

Rarely has an invention, which complies so completely with the reason and policy of the Patent Laws, been before a Court asking for protection ; and never, we think, has an invention been more conspicuously deserving of every permissible construction to give it such a liberal scope as will " prevent the " real substance of the invention from being bodily appropriated by an infringer " (110 U. S., 229).

See principal brief, p. 31.

## II.

**The experiments with air-brake apparatus in the presence of the Court.**

At the last hearing, the Boyden Company exhibited and operated some air-brake apparatus in Court, from which they urged that certain conclusions were to be drawn.

FIRST. That the Boyden structure could be operated when the ring or partition 9 was removed, so as to admit auxiliary-reservoir air to the brake cylinder, both intermittently (which they called "graduating"), and rapidly, for a fuller application; and that in both of these methods of operating the valve—intermittently and rapidly—nothing but auxiliary-reservoir air would enter the brake cylinder; and that then, by merely inserting the ring or partition 9, the structure was changed to a "quick-action" apparatus, which, when operated intermittently or slowly, would admit auxiliary-reservoir air only, for graduating and service work; but which, if operated suddenly, would admit train-pipe air to the brake cylinder for emergency use.

From this exhibition it was argued that the Boyden "quick-action" structure must be essentially different from the Westinghouse structure, and its operation due to substantially different causes.

Tersely put (see Mr. Hill's brief, pp. 40, 41), the Boyden valve was alleged to be *nothing* but an "old-fashioned triple valve," which became a "quick-action" valve, not by any structural change, but because it then operated "simply by *differential pressures*."

This conclusion was claimed to be deduced from the fact that the mere insertion into the structure of the ring, or partition 9, with its restricted aperture B (a part which does not move) changed it from one type of valve—the "old-fashioned triple," admitting only reservoir air—into another type of valve—the "quick-action" triple, admitting train-pipe air.

No such conclusions can be drawn from the experiment.

(a) No such a structure as a Boyden valve *without its partition* has ever been used *in practice*, for any purpose. Experiments in court, with a structure which no one uses or wants to use, are of little value or relevance.

(b) The structure exhibited in court as a Boyden structure, and without the partition 9, was *not simply* an "old-fashioned triple," but was a triple valve having *two valves*, one capable of *being opened independently* of the other. These valves are the stem valve (*i, j, k*) and the surrounding poppet or plug valve (22). Each is capable of *independent movement* to open its *own* port, one by the "preliminary" and the other by the "further" traverse of a triple-valve piston.

No such double-valved form of triple was known in the prior art.

The structure of Westinghouse Patent No. 141,685 (p. 736), has only a *single main valve*.

So has that of Jones' Patent No. 166,386 (p. 745).

So also with Perine Patent No. 166,405 (p. 749).

So also with Westinghouse Patent No. 168,359 (p. 752).

So also with Westinghouse Patent No. 172,064 (p. 757).

So also with Boyden Patent No. 280,285 (p. 776).

The structure of Patent No. 220,556 is alone relied upon by the defendants as exhibiting a structure having two valves. But it is *not really* a structure of the same kind as Boyden's, as is fully shown in our principal brief (pp. 72-79).

The two valves shown in Patent No. 220,556 cannot initially be made to *open independently of each other*. The main slide valve H (to which the defendants now erroneously say their valve 22 is equivalent) *always* opens, and on the *first* traverse of the piston. The interior poppet valve moves *with* it, and opens its port only to connect with one *necessarily opened by the* "main valve H." After once opening *both* valves, the sensitive poppet valve may then be *retracted* and made to *close* its port, and, incidentally, the port uncovered by the main

Diagram 1. Showing Main Valve in the  
"Closed" Position. Exhaust not Applied.

FIG. 1. Patent No. 1,000,000.



FIG. 1. Patent No. 1,000,000.

FIG. 2. Patent No. 1,000,000.



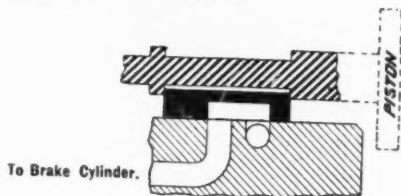
FIG. 2. Patent No. 1,000,000.

FIG. 3. Patent No. 1,000,000.

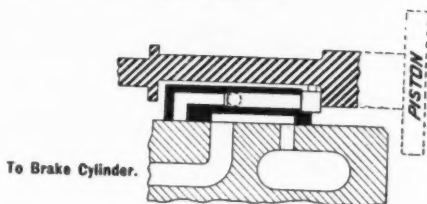


**Diagram I.—Showing Main Valve in the  
“Release” Position (Brakes not Applied).**

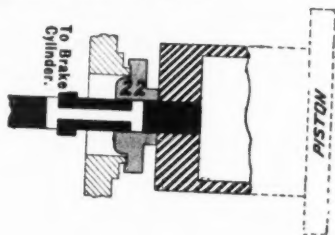
**Valve of Patent 168,359.**



**Valve of Patent 220,556.**



**Valve of Boyden Structure.**



valve, without retracting the main valve. No such action, *nor anything really resembling it*, is found in defendants' structure.

Boyden's valve, *i, j, k*, opens on the *preliminary* stroke of the piston, *without moving valve 22*; and when valve 22 is opened by a "further" traverse of the piston (which is the only way of opening it), *its* port cannot be closed by merely closing the port of valve *i, j, k*.

The two valves of defendants' structure are *both* capable of admitting *auxiliary reservoir air only*, to the brake cylinder, when the partition 9 is absent, because, in the structure as thus organized, there are no such air passages as to make it possible for *any* movement of the triple-valve piston to result in the opening of any port by which *train-pipe* air could be admitted to the brake cylinder.

The structure of Boyden exhibited in court (when unprovided with the partition 9) is, it is true, made to *look* like one form of the "old-fashioned triple" (Patent 141,685); but it differs from it, *and from every other such triple valve*, in this substantial respect, that it contains two *separately opening* valves; one (*i, j, k*) opening, *without moving the other*, only by a "preliminary" stroke of the triple-valve piston, and the other (valve 22) opening, *independently* of the first, *only* by the *extreme* or "further" stroke of the triple-valve piston. The latter valve (*viz.*, valve 22) is so located and arranged, with reference to the rest of the structure, that, *by partitioning the air passages* (by inserting the partition 9), it is brought into such relation with those passages that, by the "further" movement of the triple-valve piston, it will admit *train-pipe* air directly to the brake cylinder.

The accompanying diagrams show clearly how *unlike* to an "old-fashioned triple", such as that of Patent No. 168,359 (which is typical of the prior art) or of Patent No. 220,556, is the Boyden *two-valve* structure.

Diagram I. shows the "release" position of all three valves. Brakes are "off."



Diagram II. contrasts the effect of a "preliminary" traverse of the piston for a graduated application, in all three cases.

In Patent 168,359, there is only one main valve, and it has opened its port to the brake cylinder, *partially*.

In 220,556, *both* valves have moved and the ports through *both* of them are opened; but *partially* only, as regards the slide-valve port.

In Boyden's, *only* the sliding-stem valve *i, j, k* has opened.

It has opened *partially*, and its action is precisely like that of the *single* valve in No. 168,359, and that of the *main slide valve* of No. 220,556.

The characteristic function of the main valve, by which, entirely regardless of the form or shape of the valve, it has always been distinguished in the art, is to open, partially or fully, and to again close the port controlling the flow of air from the auxiliary reservoir to the brake cylinder. It will be observed, in Diagram II., that the main slide valve of each patent, 168,359 and 220,556, has been moved for this purpose, and that the corresponding valve in the Boyden structure is the stem valve (*i, j, k*).\*

There is nothing, in this operation of Boyden's valve, corresponding to the movement of the two valves of No. 220,556, for in No. 220,556 it is a necessity that *both* valves shall move (upon either "preliminary" or full traverse of the piston) to effect *any* opening of the "main-valve" port.

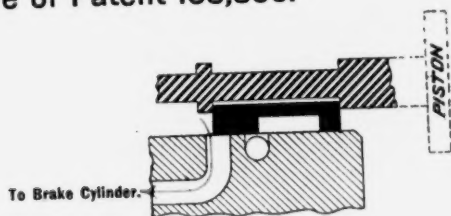
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\* The valve that performs the functions which distinguish it in the art as the *main* valve, is, in each structure (as in our former brief), colored *black*; and the supplementary valve, which performs the *port-closing* function of the main valve of Patent 220,556, is colored *yellow*.

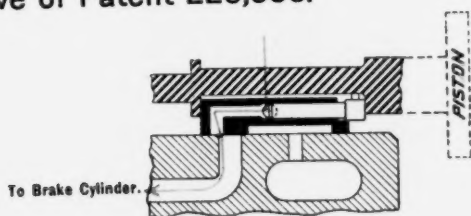
In these diagrams, only the valves and their ports are shown, the other portions of the structures having been, for greater clearness, cut away and omitted.

**Diagram II.—Showing Main Valve in a Position for making a "Graduated" Application of the Brakes.**

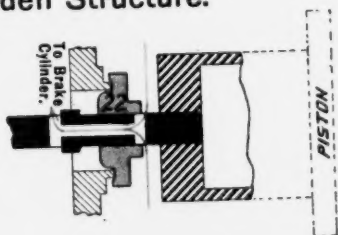
**Valve of Patent 168,359.**



**Valve of Patent 220,556.**

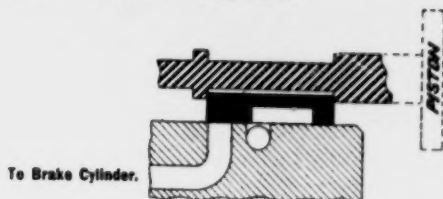


**Valve of Boyden Structure.**

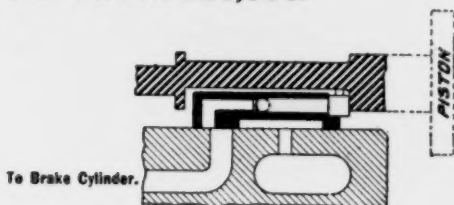


**Diagram III.—Showing Main Valve in the Position for Stopping the Flow of Air to the Brake Cylinder, after making a Graduated Application of the Brakes.**

**Valve of Patent 168,359.**



**Valve of Patent 220,556.**



**Valve of Boyden Structure.**

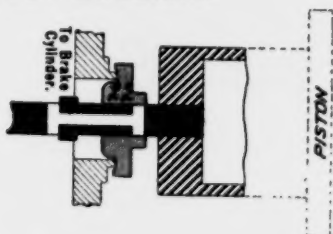


Diagram III. illustrates the function of the poppet valve of 220,556; viz., it can be made to *close* and shut off the flow of auxiliary-reservoir air without shifting the main slide valve. It can, therefore, shut off the flow of air, *even* though the slide valve may *stick* and *remain open*.

Nothing corresponding to this auxiliary method of closing the main-valve port in Patent 220,556 can be found in the Boyden structure.

The stem valve (*i, j, k*) of the Boyden structure, which *alone* [moved to open the port to the brake cylinder, has, in Diagram III., *alone* performed the main-valve function of closing the port, by moving back again from its position in Diagram II., just as the slide valve of Patent 168,359 has done, and just as does the main valve of every other form of triple valve, except one having the supplemented form of main valve shown in Patent 220,556, the main slide-valve part of which, having once been moved to open the port (as in Diagram II.), is not required to move back again to close it.

Diagram IV. illustrates the position of each valve for a full application. All three main valves—the slide valves of Patents 168,359 and 220,556,\* and the stem slide valve (*i, j, k*) of the Boyden structure—have been moved far enough to *fully* uncover the port to the brake cylinder, and to thus permit the auxiliary-reservoir air to flow into the brake cylinder somewhat more rapidly than in graduated applications.

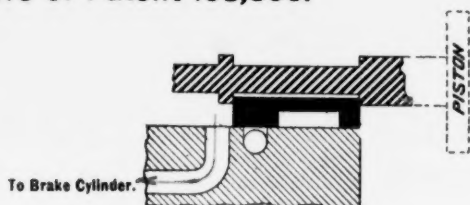
Diagrams I., II., III. and IV., collectively, illustrate *all* of the various functions of the main valve of the “old-fashioned” triple valve; viz., those of opening, partially or fully, and of closing that port which conducts the air from the auxiliary reservoir to the brake cylinder, both in graduated and in full applications of the brakes.

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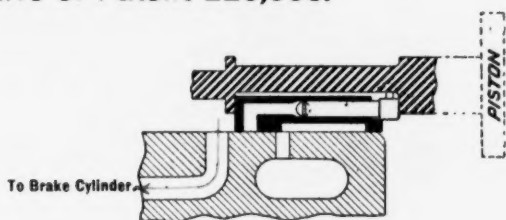
\* It is to be understood, of course, that a full application of the brakes may also be obtained by causing the port *through* the slide-valve of Patent 220,556 to register *fully* with the port below it, instead of moving the slide-valve entirely off the port, as shown in the second figure of Diagram IV. But this mode of obtaining a full application does not differ from that illustrated, except that the latter affords a slightly greater access for the same air, through a longer movement of the *same* valve.

**Diagram IV.—Showing Main Valve in the Position for a “Full” Application of the Brakes.**

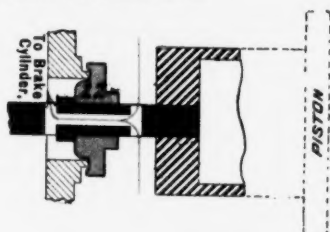
**Valve of Patent 168,359.**



**Valve of Patent 220,556.**



**Valve of Boyden Structure.**



**Diagram V.—Showing a New Operation of the Boyden Structure, Unknown in the Old Art, by which an Added and Independent Valve (22) Opens an Added and Independent Port to the Brake Cylinder.**

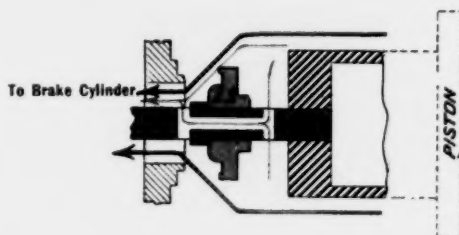


Diagram V. shows an additional operation of the Boyden structure, which has no counterpart, nor anything resembling it, in *any* form of the "old-fashioned" triple valve.

The stem valve (*i, j, k*) has here fully opened its port to the brake cylinder, in precisely the same way that it always does for a full application; *but, in addition thereto*, ANOTHER valve (valve 22), *not anywhere found in the "old-fashioned" art*, and which has been idle and inert in each of the previously described customary operations of the main valve, has *here* been moved, by the extreme, or "further," traverse of the piston, and, when so moved, has opened an *additional and independent port* (also *new* to the art) leading to the brake cylinder.

If this structure be used without any partition 9 and restricted aperture therein (as *experimented with in Court*), the opening of this *additional valve 22* will *then* (as presently to be shown) be useless and even injurious (by intensifying shocks—See p. 16 *infra*).

But if the structure be used *with* the partition 9 and its restricted aperture (as is *always* done in practice), *then*, when the *additional valve 22* is thus opened, such a *difference of pressure* ("differential pressures") is thereby produced on opposite sides of the check valve (which controls the admission of train-pipe air) that the check valve instantly opens, and *train-pipe* air pours directly under the check valve and under valve 22 into the brake cylinder, thereby producing both a "quick application" of the brakes on each individual car and a venting of the train pipe at each car, so as to produce quick serial application of the brakes from car to car.

Hence, the Boyden valve exhibited in Court was *not merely* an "old-fashioned triple" valve. On the contrary, it was an old form of triple valve *supplemented* by being provided with a *new valve*, which is opened *only* by the *extreme* traverse of the triple-valve piston, and which is *thus adapted*, upon the



insertion of the partition with its restricted port, to admit *train-pipe* air direct to the brake cylinder.

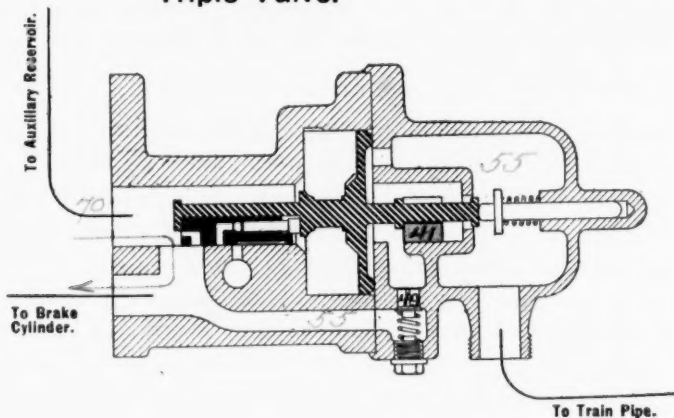
(c) The fact that the operation of the Boyden valve structure, exhibited in Court, can be changed, by the insertion of the non-moving ring or partition, from that of a valve admitting only auxiliary-reservoir air to that of a "quick-action" triple valve, which admits train-pipe air because of the production of differential pressures on opposite sides of the check valve, does not indicate that Boyden's structure differs substantially from that of Westinghouse. That suggestion is fully met by the fact, pointed out at the last argument and illustrated by a model, that the Westinghouse "quick-action" valve also operates as a "quick-action" valve *exclusively* by the production of differential pressures on opposite sides of the check valve (49), caused by the opening of the emergency valve (41); and that the whole character of the Westinghouse valve can also be changed from a "quick-action" valve to a valve which is substantially only an "old-fashioned triple" (because it admits only auxiliary-reservoir air) simply by the removal of a portion of the *partition* X, and thus enlarging, or doing away with, the *restricted* port, which, when present, holds back or chokes the flow of auxiliary-reservoir air, and causes a lower pressure to exist on the under side of the check-valve (49) than exists on the upper side (*i. e.*, a condition of "differential pressures.")

This is illustrated by the diagrams on the opposite page.

With the removal of portion X, of the partition between the passages for the flow of air from the auxiliary reservoir and from the train pipe, as shown in Fig. 1, the only possible *operation* of the structure is that of an *ordinary* "old-fashioned" triple, because the flow of auxiliary-reservoir air into the passage below the check valve will then be so rapid that the pressure on the lower side of the check valve will prevent its opening, notwithstanding the fact that the valve 41 has been fully

**Diagram Illustrating the Necessity of a Partition with a Restricted Port, in the Triple Valve of Patent No. 360,070, to cause "Quick-Action".**

**Fig. 1.—Partition X Removed. Structure can operate only as an "Old-Fashioned" Triple Valve.**



**Fig. 2.—Partition X Inserted. Structure becomes a "Quick-Action" Triple Valve.**

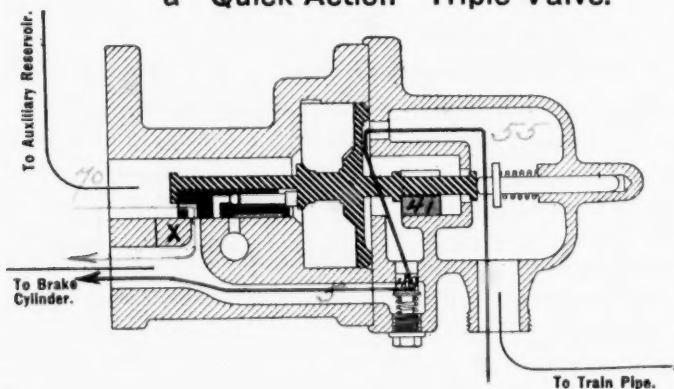


Diagram illustrating the Necessity of a  
 Partition with a Restricted Port in the  
 Triple Valve of Patent No. 360,070, to  
 cause "Quick-Action"

Fig. 1-Partition X Removed. Structure can  
 operate only as an "Old-Fashioned"  
 Triple Valve.



Fig. 2-Partition X Inserted. Structure becomes  
 a "Quick-Action" Triple Valve.



opened. The valve 41 and its port then become mere idle and useless parts.

But, with the portion X inserted (so as to provide only a *restricted* port for the flow of auxiliary reservoir air), as shown in Fig. 2, the structure becomes a "quick-action" structure, operating to produce "quick action" upon the extreme movement of the triple-valve piston, and the consequent opening of the emergency port, because pressure from the auxiliary reservoir is thereby choked or held back from the passage below the check valve, and the opening of the check valve (49) is then inevitable, because of the *differential pressures* on its opposite sides.

The experiment before the Court, therefore, when properly understood, does not prove that the Boyden valve differs in any substantial respect from the Westinghouse structure, nor that it operates in any substantially different mode. Nor does the fact that it operates by "differential pressures," and that its mode of operation can be changed from *auxiliary-reservoir air* admission (the "old-fashioned" method) to *train-pipe* air admission for quick action (the new method) by the insertion of the partition or ring 9, differentiate it from the Westinghouse structure, for that valve also operates through precisely the same causes, and it may also be changed from a "quick" action to an "old-fashioned triple" action by a similar simple removal of a restricted port in the partition between the air passages.

(d) These facts also refute another contention of the defense, that a partition containing a restricted port was *first invented* by Mr. Boyden. Such a partition, illustrated by the portion X, constitutes as vital a feature of the Westinghouse valve as it does of the Boyden valve. (See former Brief, p. 58.)

SECOND. A second proposition advanced by defendants' counsel, based upon the Court exhibition, was that a triple-

valve structure operates just as *quickly* and as *powerfully* when acting in the old-fashioned way, simply by admitting auxiliary-reservoir air, as does a Westinghouse "quick-action" valve, operating by the admission of train-pipe air.

The quicker *serial* application of the brakes, which results from the admission of train-pipe air, was *conceded*; but it was claimed that the Court could see for itself that the brakes were applied as quickly, on a single car, by the full application of auxiliary-reservoir air, as they were by the full application of auxiliary-reservoir air *plus* train-pipe air.

All such conclusions from the Court experiments would be very misleading.

The fact is that the application of the brakes by train-pipe air admission to the brake cylinder, in what is known as "quick action," by either the Westinghouse or Boyden valve, is not only *serially* more speedy, but is also *individually* both more speedy and more *powerful*.

This is, in substance, stated in the patent in suit (Patent, p. 787, fol. 1282). The patent states that the air discharged from the train pipe

"is utilized in the performance of preliminary work, it being found in practice that the air so taken from the pipe will exert a pressure of about twenty-five pounds in the brake cylinders."

From this statement, *greater quickness in reaching maximum pressure* and a *nearer approach to maximum pressure* are both necessarily deducible (as we shall next show), and this increased efficiency is proved, without contradiction, as an affirmative fact ( *Westinghouse, Rec.*, p. 124, fol. 186 ).

While it is true that, under no circumstances, can the pressure in the brake cylinders (even in "quick action") be greater than the initial pressure in the main reservoir or in the auxiliary reservoirs (say 70 pounds to the square inch), yet this

statement does not touch the point now under consideration.\* The problem was, and is, how *quickly* a *maximum* pressure can be reached by the filling of the brake cylinders with air under the *highest obtainable pressure*, and how near an approximation to the *maximum* pressure can be reached, notwithstanding the inevitable loss of *some* pressure in the act of *expanding into the brake cylinders*.

The Westinghouse quick-action valve of the patent in suit fills the brake cylinders with air under pressure (1) with *greater rapidity*, and (2) with a *nearer approximation* to the *maximum* pressure (70 pounds) than can be done from an auxiliary reservoir only, because,

FIRST. By its use, air under pressure is rushing in *both* from the train pipe and from the auxiliary reservoir, and the cylinders will, of course, fill faster with air under pressure when admitted *from two sources* than from one, other things being equal; and hence the brakes will apply quicker.

SECOND. The air in expanding into the brake cylinder necessarily loses a considerable proportion of its original pressure, because the same air has then to fill a much larger space, and necessarily loses pressure in expanding. It loses pressure in proportion to the expansion.

If, however, *train-pipe* air is rushing into the brake cylinder simultaneously with, or in advance of, the auxiliary reservoir air, and if it contributes *also* to fill the cylinder (exerting,

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\*The opinion of the Circuit Court of Appeals, at page 875, quotes a remark made in oral argument by one of complainant's counsel to the effect that "quick action" does not involve *greater* power. This remark is true in the sense that no greater power can be exerted *than that in the main reservoir or in the auxiliary reservoir*; but is inaccurate (for the reasons above given), if understood to mean that there is no greater pressure *at the brakes*, when *both* "train pipe" air *and* "auxiliary reservoir" air are utilized, than is the case when "auxiliary reservoir air" *only* is admitted. The contrary is proved and is the fact.

say, 25 pounds of pressure—Patent, p. 787), it is clear that it, to that extent, lessens the degree of expansion, and consequent loss of pressure by expansion, of the auxiliary reservoir air, which would otherwise occur. The *ultimate pressure* in the brake cylinder, and, consequently, upon the brake shoes, will be considerably greater if train-pipe air has been first injected, than if auxiliary reservoir air *alone* was employed.

This reduction of pressure, in expanding from the auxiliary reservoir, is incidentally adverted to several times in the proofs (Record, p. 317, fol. 488 ; 320, fol. 493), although the explanation above given is not found at length in the record. The fact of the existence of both *greater* and *more quickly-attained* pressure, due to train pipe "quick action," was never, however, disputed.

THIRD. As already noted in our previous brief (p. 15), it is not practical "for constructive reasons," to have the opening from auxiliary reservoir to brake cylinder a large one ; hence the brakes were never applied by the "old-fashioned" triple nearly so quickly, by auxiliary-reservoir pressure, as they can be, *and are*, in "quick action", by adding train-pipe pressure also, as utilized in the valve of the patent in suit.

FOURTH. Even though a large opening should be made from auxiliary reservoir to brake cylinder, in the case of a *single* individual triple valve (which was all that was shown in the Court experiments), yet no such large opening can be *thrown wide open* in actual practice, where a *number* of "old-fashioned" triple valves are arranged serially upon a long train. Each succeeding valve would open to a less extent than the one ahead of it in the train, and, while quick *individual* action might be had upon the *first* car, slow individual action only could be obtained upon the last cars. The making of a *large* aperture, which would open *fully* on the front cars, while only small apertures can be opened on the rear cars, would

*intensify* the disastrous shocks beyond anything which was ever found to exist where a small aperture from the auxiliary reservoir was used on all the cars. Hence, *small* apertures in the valves on *all* cars was the only practical construction.

This is fully explained by Mr. Westinghouse (Record, pp. 317-320), and is undenied.

The Court experiments, therefore, being with a single valve, only, and a single brake cylinder, necessarily failed to demonstrate that equally quick and equally powerful action could be practically obtained from auxiliary-reservoir air pressure alone as by the method of the patent in suit.

### III.

#### **The prior state of the art in emergency application of Brakes.**

Mr. Hill's description of "development of the triple valve," pages 8-10 of his brief, seems to involve an effort to make it appear that "quick action", or "emergency" application, was not a new thing in air brakes at the date of the present invention.

Defendant's position herein is briefly replied to in our original brief, page 115. A word or two more may be admissible for greater clearness.

"Quick action", as we now understand the term, was absolutely unknown prior to 1886.

The only emergency action provided for or contemplated in the patents thus referred to by Mr. Hill, or to be found anywhere in the prior art, was that which resulted from the use in emergencies of a *slightly* larger port to the brake cylinder, for air from the *auxiliary reservoir*, than in graduating use.

As already explained, and for "structural reasons," in ordi-



nary service use, air was admitted *slowly* or in *limited quantities*, and could not be admitted otherwise from auxiliary reservoirs. When it was desired to stop the train in the presence of danger, the admission of air was *somewhat more rapid*; but—and this is the important point herein—the air thus admitted, for what is *alleged* to have been “quick action”, could not be admitted *in bulk*, and *was the same air* as was admitted in service use or in graduating; that is, it came, in both cases, from *the same auxiliary reservoir* and not from any other source. This obviously involved only a matter of *degree* and not a difference in *kind*.

This is admitted by Mr. Hill in his brief, in the middle paragraph of page 6. Speaking of the several valves of 220,556 (one of which, he says, in the previous paragraph, is “for an emergency”), he adds that they “perform the same *kind* of function and differ only in the *degree* or manner of performance.”

From this it will be obvious that, when Mr. Westinghouse provided for augmenting or supplementing auxiliary-reservoir air—the *only air previously used*—by taking air *from the train pipe* and charging it into the brake cylinder, by a *large and direct* port, he made an improvement which was different not merely in *degree* but also in *kind*.

How vitally important this change was, we have already shown.

Hence the “quick action” or “emergency” feature of the invention, now in question, is a radically different thing from the “quick action” or “emergency” previously known in the art, and on which so much stress seems to be laid in defendant’s brief.

Mr. Hill, in his brief, under the head “Triple Valve Defective on Long Trains” (pp. 12, 13), has very happily stated and explained the fact that, though a double-traverse piston had been previously used in the automatic brakes of short trains in passenger service, the second or further traverse was

wholly impracticable when the same apparatus was applied to long trains.

It necessarily follows, as a corollary, from this that when Mr. Westinghouse adapted the double traverse feature to the requirements of long trains, *he did something more than merely retain, without change of function, this old double traverse.* Combining it with the means which he devised for charging *train-pipe* air into the brake cylinder, he gave it a new function and a new operation. Hence, in this case, the merit of the invention does not rest solely on the devising of a system of apparatus for supplementing *auxiliary-reservoir* air by *train-pipe* air, but Mr. Westinghouse's merit as inventor is still further enhanced by his *ability* to utilize, and by his *success in utilizing* the "*farther traverse*" of the triple valve piston to do work which it never did before, and to do that work in a place where, as previously organized, it was incapable of being used.

Mr. Hill's brief deals, *also*, with the subject of quicker action by locally venting the train pipe, on pages 14 and 15. He cites a statement from Westinghouse Patent No. 217,838, dated July 22, 1879, as tending to show that the *mere* local venting of a train pipe at intervals along the train was not new.

Patent No. 217,838 is dealt with on pages 110-112 of our principal brief, and it is there shown :

FIRST. That Judge MORRIS distinctly held that this patent not only did not solve the problem of "quick action," but did not take the first really practical step in the direction of practically solving it.

This ruling was not questioned by the Boyden Company on the appeal, nor was any finding conflicting with it made by the Circuit Court of Appeals. On the contrary, that Court distinctly held (p. 880) that the invention of Westinghouse, although defectively claimed (in its opinion), "is one of the

highest value to the public, and *is a pioneer one in the art of quick-action brakes*," and the invention is "conspicuously one of those pioneer inventions which entitle the proprietor to a liberal protection from the Court in construing the claim."

SECOND. The mechanism of Patent No. 217,838 was absolutely inoperative and worthless for practical use.

See Evidence cited on p. 111 of our Principal Brief.

THIRD. Boyden himself admitted that such devices were not practically operative to be used in service (Former Brief, p. 111).

The primary and pioneer character of the present invention of Westinghouse is not impaired by an *unsuccessful attempt* of the same inventor, many years previously, to accomplish a *portion* of the same results.

In fact, the conclusion to be drawn from Westinghouse's unsuccessful attempt, seven or eight years earlier, is favorable, rather than unfavorable, to the pioneer character of his claims, when considered in connection with the present invention.

That Westinghouse himself had before attempted to solve the problem, and had failed to do it, is a high tribute to the importance of the present invention and to the difficulty of solving the problem which was solved by the invention of the patent in suit.

*The greater individual efficiency of the brakes*, combined with *greater rapidity in serial application*, and all under the control of the engineer, so that the apparatus was capable of the most delicate, as well as full, action in service work, and also the most energetic and powerful action in emergency work, was a problem which *had not even been attacked* until it was attacked by Westinghouse.

It has been said that nothing so strengthens the presumption in favor of a patent as an unsuccessful attempt to over-

throw it (*Sargent vs. Seagrave*, 2 Curt., 553); and it may also be said that nothing is more pertinent, upon the question of the essential novelty and utility of a patent, than earlier and unsuccessful efforts to accomplish similar results, which efforts have been abandoned or have never gone into practical use, and which even the defendant, who relies upon them, cannot assert are now practical.

#### IV.

#### The Scope of the Patent in Suit.

Mr. Hill, in his able brief, on page 23, discusses this question under the heading "*What is 360,070 entitled to cover?*" He states that the patent is not entitled to cover *merely* the prevention of shocks, nor *merely* local venting of the train pipe, nor *merely* the utilization of the extreme traverse of the triple-valve piston for another purpose (viz., the admission of reservoir air).

But none of these things, *in themselves*, are claimed in the patent in suit, nor has there been any effort to claim or cover them.

Mr. Hill then goes on to state what, in his opinion, the patent *is* entitled to cover. He says (p. 23):

"It was entitled, however, to cover a mechanical device; namely, the auxiliary valve 41 governing the special by-passage leading directly from the train pipe to the brake cylinder."

And, again (*Id.*):

"In other words, Patent 360,070, while not solving the problem of quick action, furnished for its subsequent solution by Mr. Westinghouse an important *factor*, consisting of the auxiliary valve and its by-passage, arranged to be put into action by the extreme traverse of the triple-valve piston. This Patent, 360,070, did not itself accomplish the desired result;

but it furnished an *element* for the subsequent combination by which Mr. Westinghouse finally achieved that result. *It should be construed, therefore, as a patent for that element or factor, broadly, and for nothing more.*"

(The italics are Mr. Hill's.)

Mr. Hill, in this and other passages throughout the brief, concedes what is undisputed ; that is, the pioneer character of Westinghouse's invention. Indeed, no contention has ever been made that the Westinghouse claims are not entirely valid, so far as novelty is concerned. The only question raised against any of them (in the line of validity) is the attack upon the second claim, due to its alleged defectiveness of form.

If Mr. Westinghouse was, as he is thus conceded to have been, the first person who ever constructed a brake apparatus in which a triple-valve device was provided with an auxiliary valve governing a passage leading directly from the train pipe to the brake cylinder, and if, as is also conceded, he accomplished thereby a perfectly novel and highly valuable result, why, in the name of common sense, and of the uniform rule of construction of patents of this character, should he be limited, as Mr. Hill claims, to "*the* auxiliary valve 41," or to "a special *by*-passage."

Is not Mr. Westinghouse entitled, also, to cover all combinations which are the equivalent of his, even though the forms of the individual parts may widely vary from his forms ? Is he not so entitled at least as much as any other inventor, and more so than most inventors ?

Did the essential novelty of his invention rest in "*the*" valve 41, or in its particular location in the structure, or in its particular shape ? On the contrary, was not the invention broader than that ; to wit, the combination, with a triple-valve structure, of an emergency valve which should open a direct passage from train pipe to brake cylinder when the valve structure is subjected to a rapid reduction of pressure, as described ?

Why is Mr. Westinghouse to be limited to a *particular passage* for the train-pipe air; or why must he be limited, still more closely, to a special *by*-passage for such air?

Did his invention lie in the special character or location of such passage?

We think not.

In *Western Electric Co., La Rue*, 139 U. S., 601, this Court took occasion to say, in overruling a narrow and limited construction of a patent for a useful invention:

"Since the case of *Winans vs. Denmead* (14 Howard, 330) it has been settled doctrine of this Court, as expressed in the opinion of Mr. Justice CURTIS, page 343, that, the patentee having described his invention, and shown its principle, and claimed it in that form which most perfectly embodies it, is, in contemplation of law, deemed to claim every form in which his invention may be copied, unless he manifests an intention to disclaim some of those forms."

The same case of *Winans vs. Denmead* contains the following statement:

"Where form and substance are inseparable, it is enough to look at the form only. Where they are separable—where the whole substance of the invention may be copied in a different form—it is the duty of courts and juries to look through the form for the substance of the invention: for that which entitled the inventor to his patent, and which the patent was designed to secure. Where that is found, there is an infringement; and it is not a defense that it is embodied in a form not described and in terms claimed by the patentee."

To the same effect is the opinion of this Court in *Machine Co. vs. Murphy*, 97 U. S., p. 120, cited on our previous brief (p. 52).

The pioneership of the patent in suit is expressly admitted by Mr. Hill in his brief, on page 52, as follows:

"Tested by this rule, the patent in suit, 360,070, was pioneer as to the auxiliary valve 41 and its *by*-passage, covering them and their mechanical equivalents, in whatever form they may be used."

As we have clearly shown, in our previous brief, that the de-

fendant's structure contains an "auxiliary valve" (22), and that the function of that valve is to admit *train-pipe air* direct to the brake cylinder, by being pulled off its seat by the extreme traverse of the triple-valve piston, and that the defendants' structure also contains the other prerequisite, viz., the preliminary traverse of the piston, which, through *another valve (i j k)*, admits air from the auxiliary reservoir to the brake cylinder, for service use, it is clear that this statement of Mr. Hill's is sufficient to cover the case of the defendants' structure, unless too much stress be laid upon his phrase "*by-passage*."

The defendants' passage from train pipe to brake cylinder is a *through* passage, instead of a *by-passage*, but, perhaps, on this account, it is all the more a *direct* passage, which is the only essential characteristic of the passage referred to in the Westinghouse claim.

## V.

### The Position of the Court of Appeals.

In discussing the question of infringement, the Court of Appeals in the present case (at foot of page 881) used the following argument, as negating infringement by the Boyden structure:

"But Boyden simply substituted in the original triple valve his poppet valve 22 for the slide valve which is the main valve of Patent 220,556. Boyden's is not an 'auxiliary' valve; it is mechanically the original main valve of the original triple valve, and it performs the service which is performed by the main valve of 220,556. It is not the mechanical equivalent of valve four in the attached apparatus of Westinghouse simply by reason of its taking part in an emergency service in admitting train-pipe air into the brake cylinder; in the original triple valve it performed no other service than admitting auxiliary reservoir air into the brake cylinder; in Boyden's device it

continues to perform that service, and is made incidentally instrumental in allowing the passage of train-pipe air. The performance incidentally of quick-action service does not make it an auxiliary valve. It is the same valve. The incidental service is auxiliary, but the valve itself is the same and unchanged."

Here is a singular misapprehension of fact, and, as we submit, of law also.

FIRST. *As to the fact.*

As already shown, valve 22, when the Boyden structure is complete, and the partition 9 in its place, does not admit auxiliary reservoir air to any practical extent, nor does it perform any function of a "main valve" (as that term has always been used in the art) to any appreciable extent, and especially on long trains.

This was, in substance, held by Judge MORRIS (Rec., p. 844, fol. 1365), it was admitted by Boyden (Rec., pp. 578-9, x-Qs. 214-216), and is a physical necessity from the construction of the apparatus.

Valve *i, j, k*, does all the "main-valve" work until main-valve work is no longer necessary to be done, because the brake-cylinder is practically full.

After that, it is possible that, by very careful manipulation, valve 22 may be opened to admit from three to five per cent. more air. But by that time the brakes are "on" with practically maximum force, and the train is so nearly stopped that so small a percentage of increase at that time cuts no appreciable figure in train control. That such increase, small as it is, ever takes place in *practice* is denied, and that it ever can take place at all, *except on short trains*, is not even asserted.

On the other hand, the recognized, admitted, prominent and *useful* function of valve 22 is to admit *train-pipe* air directly to the brake-cylinder, when pulled off its seat by the extreme traverse of the triple-valve piston, and it does that work as auxiliary to the valve, *i, j, k*, which is utilized for



"almost, if not all" admissions of auxiliary reservoir air, in service work.

How the Court of Appeals could then term this "quick-action" operation a mere "incidental" performance, it is difficult to understand.

It is the primary and only really useful service or performance for which the valve exists.

These points are elaborated on pages 38-48 of our former brief.

*SECOND. As to the law :*

Has it ever been heard that a party may infringe a patent by doing it " incidentally ? "

If the combination of apparatus in the defendants' structure is substantially the same, as to its parts and its essential mode of operation, is it any answer to call the service which it performs, and by which it is identified as to its similarity to the patented apparatus, an " incidental " service."

We think not, and we think that no decision of this or any other Court will be found which will make this a governing consideration.

## VI.

### **The contention as to the alleged invalidity of the second claim of Patent No. 360,070.**

This has been discussed on pages 79 to 82 of our former brief, and we think it does not need much further consideration.

The able and ingenious brief of Mr. Church, filed on the former argument, is not sound in its comparison of the second

claim of the patent in suit with the eighth claim of the Morse Patent.

The Morse eighth claim (15 How., 112) was, baldly, obviously and expressly, a claim for the communication of intelligible signals at any distance by the use of the electric current, "however developed," absolutely irrespective of the use of any particular mechanism.

The second claim of Patent No. 360,070 bears no fair comparison with Morse's eighth claim. It reads as follows (with two obvious insertions):

"In a brake mechanism, the combination of a main air-pipe, an auxiliary reservoir, a brake-cylinder, and a triple valve having a piston whose preliminary traverse [*by opening a port*] admits air from the auxiliary reservoir to the brake cylinder, and which by a further traverse [*by opening a port*], admits air directly from the main air-pipe to the brake cylinder, substantially as set forth."

We have inserted in the phraseology of the claim the two parenthetical statements "*[by opening a port,]*" because they are necessarily and obviously implied in the language actually used.

Air under pressure cannot possibly be admitted from one chamber, or reservoir, to another, *except by opening a port*.

To insert the words, or to leave them out, therefore, neither adds to nor subtracts from the claim. If the claim is not open to objection with these words *inserted*, then it is not open to objection with the words *omitted*, because they are necessarily implied.

Of course, the claim is not limited to any particular special or *connecting* mechanism, by and through which the triple-valve piston acts to open, or "controls," the port which admits the air.

This is, in effect, conceded by the defendants themselves, when they concede (as they do in their brief) that the valve of the New York Air Brake Co. (see p. 34 of Mr. Hill's brief)

embodies the substance of this second claim, although the connection between, and control over, the emergency valve by the triple-valve piston is absolutely and entirely different from that illustrated in the patent in suit, and involves a separate and subordinate, although important, invention.

In admitting therefore—as the truth, of course, compels them to admit—that the valve of the New York Air Brake Company (illustrated opposite p. 34 of their brief) was correctly held to be an infringement of the second claim of the patent in suit, they impliedly admit that that claim was not, and is not, limited to any special mechanism by and through which the triple-valve piston controls or opens the emergency port.

Hence, on the defendant's own admission, the second claim is not fatally defective, through omitting to specify the special connecting means; and, as every other element is expressly or implicitly stated in the claim, there can be no sound contention that the second claim is invalid for lack of specifying the means.

Mr. Hill also attempts to make the same point, in the following extract (p. 29) from his brief:

“The expression ‘whose preliminary traverse admits air from the auxiliary reservoir to the brake cylinder, and which by a further traverse admits air from the main air pipe to the brake cylinder,’ is simply the expression of a *result*.”

And therefore, as he alleges, is obnoxious to the doctrine of *Morse vs. O'Reilly*.

This is hardly correct. The *result* is the stopping of the train. The passage thus quoted is a specification of the *operation* by which the *result* is secured.

## VII.

### **The criticism upon Judge Morris' decision sustaining the charge of infringement.**

We think the Court of Appeals erred in its interpretation of the language used by Judge MORRIS, in holding that the Boyden structure infringed the second claim of the Patent No. 360,070.

While the reasons for the conclusions of the learned Judge might, perhaps, have been more happily expressed, we think that the meaning thereof is clear, and that, when correctly understood, his position is not justly subject to the criticism made upon it.

The foundation of what Judge MORRIS said was this (p. 848) :

" If the Westinghouse Patent now in suit is for an invention of a primary character, and *if the gist of that invention is the use of the further traverse of the triple valve piston to open a valve which admits air directly from the train-pipe to the brake cylinder, with the result that the train-pipe is vented and the train-pipe air utilized*, then it appears to me that the defendant cannot exculpate itself from the charge of infringement by the fact that in its device the train-pipe air is admitted through the triple valve chamber and not through a by-passage, nor by the fact that, in its device, the further traverse of the piston opens the main valve in a special manner, which produces the same result, but does not make use of a separate auxiliary valve, provided Westinghouse has not, by the explicit terms of his claim 2, restricted himself to the use of an auxiliary valve.

" I do not think that Westinghouse has so restricted himself in claim 2, although he does appear to have done so in claims 1 and 4." (Italics ours.)

We submit that Judge MORRIS was misled by the ingenuity of the defendants into making the statement that the valve 22 of the defendants' structure was not a separate auxiliary valve.

We say that he was misled, because at another part of his

opinion (p. 844, fol. 1365) he admitted that it was the valve *i j k* that

"probably in most cases does do the work of ordinary braking," and

"the main valve 22 becomes non-essential, or, *if* lifted off its seat, is *moved very gently*."

This shows that valve 22 is not in reality the "*main valve*;" that it is in truth and in fact a separate auxiliary valve and does auxiliary work, and that it was primarily and substantially exclusively intended to do "*quick-action*" work by admitting train-pipe air, and that only occasionally, by very careful manipulation, could it be made to do auxiliary-reservoir work in connection with the true "*main*" valve *i j k*.

Such being the case, we submit that Judge MORRIS, to be correct, should have held that the first and fourth claims, also, were infringed.

But, as Judge MORRIS well remarked, the *second* claim does not contain such specific language as the first claim as to the exact character of the valve which is to admit train-pipe air.

In that *second* claim it is not strictly required that such valve should be "*independent of the main valve*."

Hence, if it is such a valve, at all, as to do the work required by the claim, upon the extreme movement of the piston, and if there be another valve which admits auxiliary reservoir air upon the preliminary movement of the piston, the substance of the invention is found and the language of the second claim is satisfied.

But after clearly and correctly, as we submit, defining the gist of the invention, Judge MORRIS went on, at a subsequent part of his opinion, to use the language criticised.

In this paragraph Judge MORRIS (Opinion, p. 846) states that, in examining

"mechanisms actuated by air under pressure", in which "the transmission of power is not visible to the senses as plainly as when it is done by cranks and levers," \* \* \*

“ the functions of the instrumentalities by which it operates are more important than their forms, and in judging of an infringement we are to direct our minds rather to functional equivalents than mechanical equivalents.”

In this there was no *real* error, although the language has been read as implying a conflict with recognized principles.

What the Judge plainly intended to say was that, where the instrumentalities through which mechanisms act, as in the case of air pressures, are invisible, the *functions* which the parts perform are a truer *indication of the essential character* of those mechanisms than are the mere visible mechanical forms, because the *mere mechanisms* are not the actual operative agencies for producing results, while the invisible air pressures are the true agencies. Hence, in comparing mechanisms operating by invisible air pressures, and in comparing the action of air pressures with one another, as made operative in different mechanisms, and in therefrom determining the real character of the mechanical parts, it is entirely correct to say that what those parts *do* (*i. e.*, their *function*) is really more important than their forms, in determining *equivalency*.

Properly understood, therefore, Judge MORRIS' statements of the points to which attention should be directed, in any inquiry of this kind, is not open to fair criticism.

### **The Sum Total of Defendants' Case.**

Defendants' entire case is summed up in one italicised line of Mr. Hill's brief (p. 35), thus :

“ *In this [Boyden] device, no auxiliary valve or by-passage is employed.*”

If this one statement is erroneous, then defendants have no case.

1. The Boyden valve 22 is either *the* main valve or it is *not*. So much is clear.

2. If the Court will turn back to page 5 of Mr. Hill's brief, and to the skeleton drawing facing that page, it will be seen that the main valve, colored black, is there represented to be the valve which admits air from *the auxiliary reservoir* to the brake cylinder.

3. The proofs show—and it is not denied—that, in the graduating and service use of the Boyden apparatus, this work of admitting air from *the auxiliary reservoir* to the brake cylinder is done by the stem valve *i, j, k*, and that valve 22 does not, in such use, open at all until *substantially all* the work of braking is thus performed.

4. This being so, *i, j, k* is the Boyden “main valve,” and the Boyden valve 22 is *something else*.

5. Being *something else*, and, in its action for emergency purposes, being *auxiliary* to the main valve *i, j, k*, it becomes an *auxiliary valve*. It *can* be nothing else.

As to what “auxiliary” means, see the first three lines of page 4 of Mr. Hill's brief. Apply this definition of Mr. Hill's to the Boyden valve 22, and it is clear that it is an *auxiliary* valve.

6. We believe that we have already made it clear that the Boyden air conduit F through his piston 16, and through the valve 22, is a *by*-passage—as much so as the Westinghouse. It goes “*by*” or past the auxiliary reservoir without charging train-pipe air into such reservoir, but conveys it *direct* to the brake cylinder.

Hence, it is submitted that defendants' case, as thus summed up in a single line by defendants' leading counsel, is based wholly on errors of fact and a misuse of names.

## What Complainant's Said in the Court of Appeals.

Mr. Hill, in his brief (p. 30), makes some citations from our briefs in the Court of Appeals, as involving a *supposed* more limited view of the invention than that now presented in this Court. Such was no part of our view of the case then or now. Everything we then said of the Westinghouse invention we also said and now say of the Boyden valve. It has a "quick-action attachment, consisting of an air conduit or passageway, directly from the train-pipe connection to the brake cylinder."

Such "an air conduit or passageway" will be found in the Boyden triple valve, through the piston at F, through the side ports uncovered by the valve 26, and through the port uncovered by the valve 22, as illustrated by blue lines in Fig. 22, facing page 40 of our original brief.

And that air conduit or passageway goes "directly from the train-pipe connection to the brake cylinder."

And it has "a valve [22] to control it."

And in the broad, general sense of the term, it is an "*attachment*," as much so in one case as in the other.

In Westinghouse this "air conduit or passageway" is bored through the triple-valve *casing*; in Boyden it is bored through the triple-valve *piston and casing*.

We also said, and say yet, that this new quick-action feature or element was, in substance and effect, "another brake mechanism." So it is in the Boyden valve. For ordinary service use, the Boyden triple piston opens the stem-valve ports *i, j, k*, by the preliminary traverse of the piston, and thereby substantially all the work of ordinary braking is done. The additional brake mechanism, represented by the further traverse of the piston, by the passageway through it, and by the valve 22, are then inoperative and inert.



But when "quick action" is required, then *they*, as an *additional* brake apparatus, and auxiliary to the *service* apparatus, are brought into operation.

Hence, what we then said, being as true of Boyden as it is of Westinghouse, cannot be used as an admission that the Westinghouse claims here in controversy are to be limited otherwise than in accordance with their terms.

And this same comment applies to what Mr. Hill says under "Fourth," page 50.

And, as the same quotations are made by Mr. Fenton in his brief (p. 9), we make the same reply to him.

### Two Inaccuracies.

BOYDEN 1883 PATENT: Of this, Mr. Hill says (p. 16) that, by it,

"compressed air could be transmitted directly from the train pipe to said valve chamber and thence to the brake cylinder, *to augment the pressure of the brakes.*" (Italics are ours.)

The exact facts in this regard are presented in our original brief (pp. 106, 107) by extracts from the testimony of Mr. Boyden himself. By comparing what Mr. Boyden says with what Mr. Hill says, the misleading character of the latter will be obvious.

PATENT OFFICE ACTION: The idea, not merely suggested, but positively asserted by Mr. Hill (p. 55), that the *ex parte* statements made by Mr. Boyden in the descriptive part of his specification, are "officially endorsed as true" by the Commissioner of Patents, "by granting the patent which contains them," etc., hardly does justice to Mr. Hill's knowledge either of law or of Patent Office practice.

And, as this includes one of our assignments of error in our application for a *certiorari*, we summed up the facts and the law with some fullness in our original brief (pp. 83-91);

and, in so far as what Mr. Hill says differs therefrom, we submit with confidence that he is in error.

We submit that the decree of the Circuit Court of Appeals should be reversed, and the cause remitted to the Circuit Court with directions to enter a decree for complainants on the *first*, *second* and *fourth* claims.

Respectfully submitted,

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